User Guide

AWS DataSync

AWS DataSync: User Guide

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What is AWS DataSync?

AWS DataSync is a secure, reliable, high-speed file transfer service that helps you quickly and easily transfer your file or object data to, from, and between AWS storage services.

On-premises storage transfers

DataSync works with the following on-premises storage systems:

- Network File System (NFS)
- Server Message Block (SMB)
- Hadoop Distributed File Systems (HDFS)
- Object storage

AWS storage transfers

DataSync works with the following AWS storage services:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

Other cloud storage transfers

DataSync works with the following storage services in other clouds:

- Google Cloud Storage
- Microsoft Azure Blob Storage
- Microsoft Azure Files
- Wasabi Cloud Storage
- DigitalOcean Spaces
- Oracle Cloud Infrastructure Object Storage

- Cloudflare R2 Storage
- Backblaze B2 Cloud Storage
- NAVER Cloud Object Storage
- Alibaba Cloud Object Storage Service
- IBM Cloud Object Storage
- Seagate Lyve Cloud

Use cases

These are some of the main use cases for DataSync:

- **Migrate data** – Transfer active datasets rapidly over the network into AWS storage services. DataSync includes automatic encryption and data integrity validation to help make sure that your data arrives securely, intact, and ready to use.
- **Archive cold data** – Move cold data stored in on-premises storage directly to durable and secure long-term storage classes such as S3 Glacier Flexible Retrieval or S3 Glacier Deep Archive. Doing so can free up on-premises storage capacity and help you shut down legacy systems.
- **Replicate data** – Copy data into most Amazon S3 storage classes, choosing the most cost-effective one for your needs. You can also send data to Amazon EFS or Amazon FSx for a standby file system.
- **Transfer data for timely in-cloud processing** – Transfer data in or out of AWS for processing. This approach can speed up critical hybrid cloud workflows across many industries. These include machine learning in the life-sciences industry, video production in media and entertainment, big-data analytics in financial services, and seismic research in the oil and gas industry.

Benefits

By using DataSync, you can get the following benefits:

- **Automate data movement** – DataSync makes it easier to transfer data over the network between storage systems and services. DataSync automates both the management of data-transfer processes and the infrastructure required for high performance and secure data transfers.
- **Transfer data securely** – DataSync provides end-to-end security, including encryption and data integrity validation, to help ensure that your data arrives securely, intact, and ready to

use. DataSync accesses your AWS storage through built-in AWS security mechanisms, such as AWS Identity and Access Management (IAM) roles. It also supports virtual private cloud (VPC) endpoints, giving you the option to transfer data without traversing the public internet and further increasing the security of data copied online.

- **Move data faster** – DataSync uses a purpose-built network protocol and a parallel, multi-threaded architecture to accelerate your transfers. This approach speeds up migrations, recurring data-processing workflows for analytics and machine learning, and data-protection processes.

Additional resources

We recommend that you read the following:

- DataSync resources – Includes blogs, videos, and other training materials
- AWS re:Post – See the latest discussion around DataSync
- AWS DataSync pricing

How AWS DataSync works

Learn the key concepts and terminology related to AWS DataSync transfers, including how data gets transferred from on-premises and cloud locations.

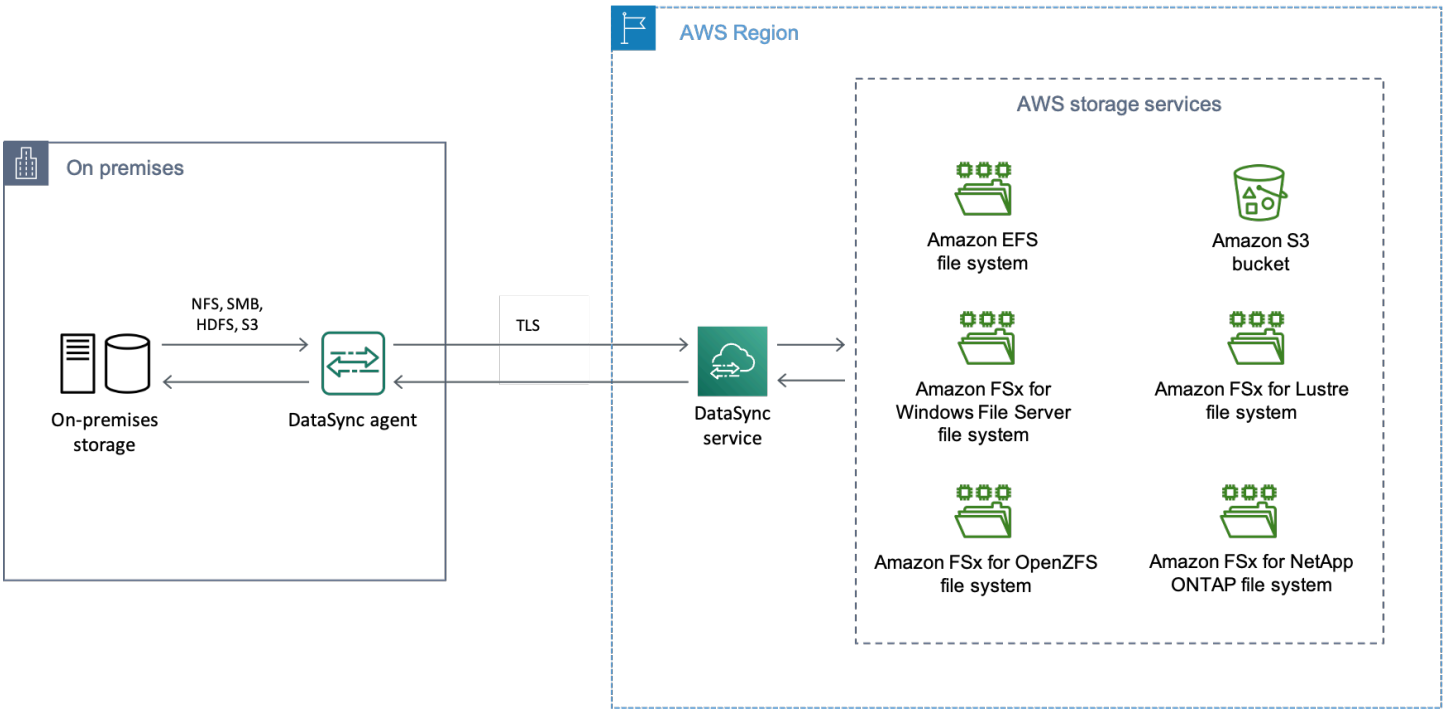
DataSync transfer architecture

The following diagrams show how and where DataSync commonly transfers storage data. For a full list of DataSync supported storage systems and services, see Where can I transfer my data with AWS DataSync?

Topics

Transferring between on-premises storage and AWS

The following diagram shows a high-level overview of DataSync transferring files between self-managed, on-premises storage systems and AWS services.

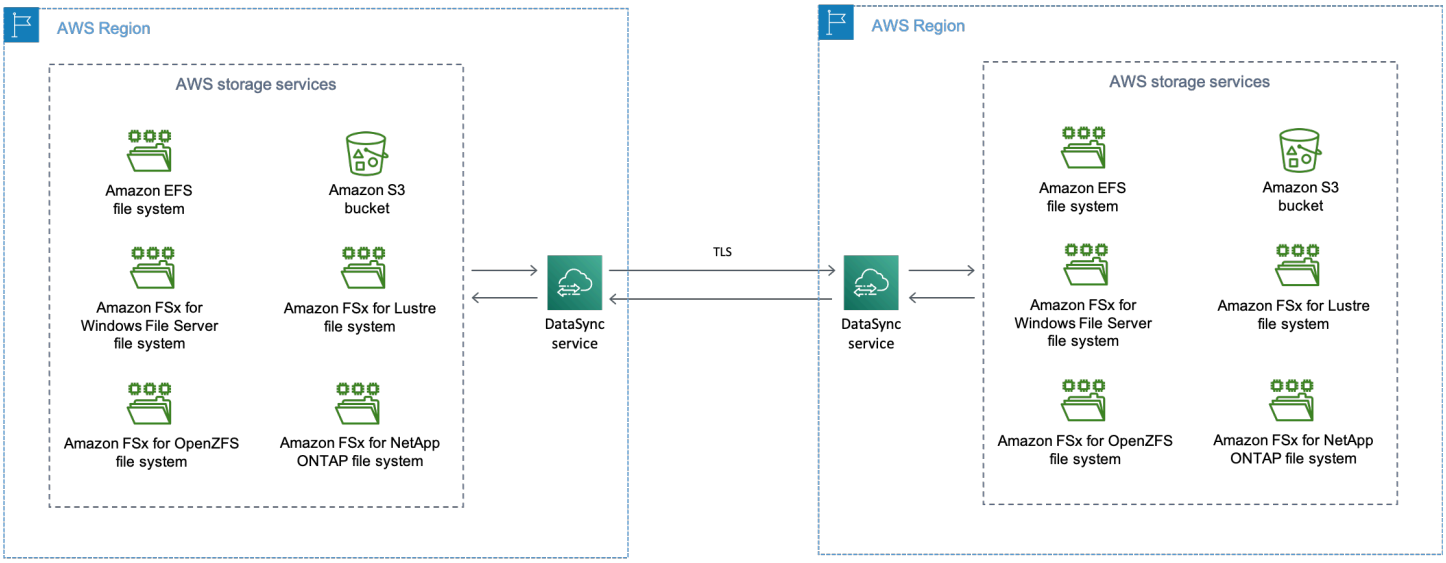


The diagram illustrates a common DataSync use case:

- A DataSync agent copying data from an on-premises storage system.
- Data moving into AWS, encrypted using Transport Layer Security (TLS).
- DataSync copying data to a supported AWS storage service.

Transferring between AWS storage services

The following diagram shows a high-level overview of DataSync transferring files between AWS services in the same AWS account.



The diagram illustrates a common DataSync use case:

- DataSync copying data from a supported AWS storage service.
- Data moving across AWS Regions, encrypted using TLS.
- DataSync copying data to a supported AWS storage service.

When transferring between AWS storage services in the same account (whether in the same AWS Region or across AWS Regions in the same partition), no agent is required. Your data remains in the AWS network and doesn't traverse the public internet.

Important

You pay for data transferred between AWS Regions. This is billed as data transfer OUT from your source Region to your destination Region. For more information, see Data transfer pricing.

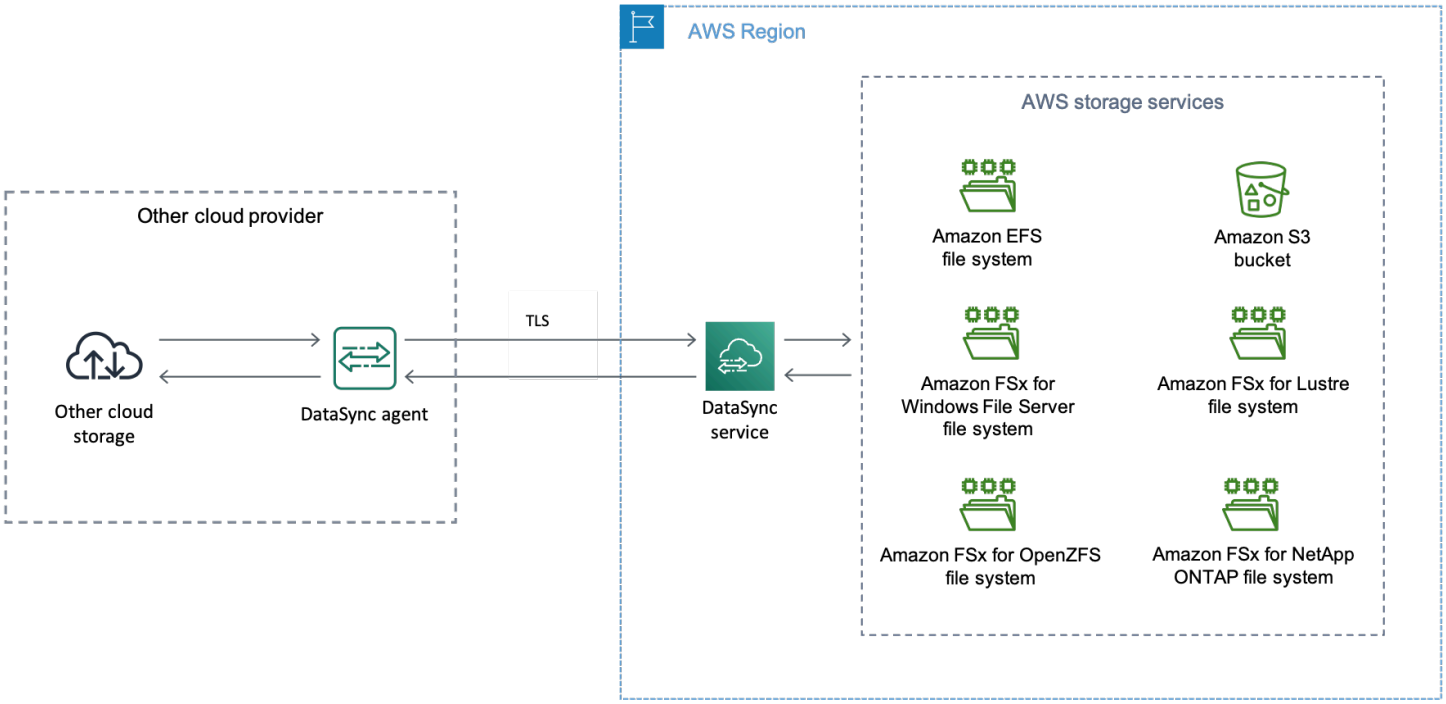
Transferring between AWS storage services and storage systems in other clouds

With DataSync, you can transfer data between other cloud storage systems and AWS services. In this context, cloud storage systems can include:

- Self-managed storage systems, such as an NFS file server in your virtual private cloud (VPC) within AWS.
- Storage systems or services hosted by another cloud provider. For more information, see Transferring to or from other cloud storage with AWS DataSync.

DataSync can copy data to and from other clouds with or without using an agent. For more information about when to use an agent, see Do I need an AWS DataSync agent?.

The following diagram shows a high-level overview of DataSync transferring data between AWS storage services and another cloud provider.



Concepts and terminology

Familiarize yourself with DataSync transfer features.

Topics

- Agent
- Location
- Task
- Task execution

Agent

An *agent* is a virtual machine (VM) appliance that DataSync uses to read from and write to storage during a transfer. DataSync provides two types of agents, with one handling Basic mode tasks and another handling Enhanced mode tasks. For more information about choosing an agent for your use case, see Choosing an agent for your task mode.

You can deploy an agent in your storage environment on VMware ESXi, Linux Kernel-based Virtual Machine (KVM), Nutanix AHV (using the KVM agent image), or Microsoft Hyper-V hypervisors.

For storage in a virtual private cloud (VPC) in AWS, you can deploy an agent as an Amazon EC2 instance.

To get started, see Do I need an AWS DataSync agent?

Location

A *location* describes where you're copying data from or to. Each DataSync transfer (also known as a *task*) has a source and destination location. For more information, see Where can I transfer my data with AWS DataSync?

Task

A *task* describes a DataSync transfer. It identifies a source and destination location along with details about how to copy data between those locations. You also can specify how a task handles metadata, deleted files, and permissions.

Task execution

A *task execution* is an individual run of a DataSync transfer task. There are several phases involved in a task execution. For more information, see Task execution statuses.

How DataSync transfers files, objects, and directories

During a task execution, DataSync prepares, transfers, and verifies your data. How DataSync performs these actions depends on how you configure your DataSync task options, such as the task mode. Basic mode tasks prepare, transfer, and verify your data sequentially, while Enhanced mode tasks do these in parallel.

Topics

How DataSync prepares your data transfer

DataSync by default prepares your transfer by examining your source and destination locations to determine what to transfer. This is done by scanning the contents and metadata of both locations to identify differences between the two.

> **Note**
>
> If you configure your task to transfer all data, there's no preparation. When you start your task, DataSync immediately transfers everything from your source to your destination without comparing locations.

How DataSync prepares your transfer also depends on your task mode:

Enhanced mode preparation	Basic mode preparation
DataSync prepares objects as they're found at the source location. Preparation continues throughout the task execution until there are no more objects listed at the source. Unlike Basic mode, DataSync can prepare virtually unlimited numbers of objects with each task execution.	Preparation can take just minutes, a few hours, or even longer depending on the number of files, objects, or directories in both locations and the performance of your storage. The items that DataSync inventories in your source and destination count towards your task quotas. These quotas aren't based on the number of items that DataSync transfers during each task execution.

DataSync might skip some files, objects, and directories during preparation. The reasons for this can depend on several factors, such as how you configure your task and storage system permissions. Here are some examples:

- There's a file that exists in your source and destination locations. The file in the source hasn't been modified since the previous task execution. Since you're only transferring data that has changed, DataSync doesn't transfer that file next time you run your task.

- An object that exists in both of your locations changes in your source. When you run your task, DataSync skips this object in your destination because your task doesn't overwrite data in the destination.
- DataSync skips an object in your source location that's using an archival storage class and isn't restored. You must restore an archived object for DataSync to read it.
- DataSync skips a file, object, or directory in your source location because it can't read it. If this happens and isn't expected, check your storage's access permissions and make sure that DataSync can read what was skipped.

How DataSync transfers your data

DataSync copies your data (including metadata) from the source to the destination based on your task options. For example, you can specify what metadata gets copied, exclude certain files, and limit how much bandwidth DataSync uses, among other options.

How DataSync transfers your data also depends on your task mode:

Enhanced mode transferring	Basic mode transferring
DataSync transfers each object as soon as it's prepared.	Once DataSync prepares all of your data, the transfer begins.

DataSync might skip some items during the transfer. If you configure your task to transfer all data, this can happen with an object in your source location that's using an archival storage class and isn't restored.

How DataSync verifies your data's integrity

DataSync always performs integrity checks on your data during a transfer. At the end of a transfer, DataSync can also perform additional checks on just the transferred data or the entire dataset in both locations. For more information, see Configuring how AWS DataSync verifies data integrity.

When checking data integrity, DataSync calculates and compares the checksum and metadata of the files, objects, or directories in your locations. If DataSync notices differences between locations, verification fails with an error. For example, you might see errors such as `Checksum failure`, `Metadata failure`, `Files were added`, or `Files were removed`.

How verification works depends on your task mode and whether you configure DataSync to verify data integrity at the end of your transfer.

Enhanced mode verification	Basic mode verification
DataSync verifies each object as it's transferred to your destination. With Enhanced mode, DataSync verifies only transferred data.	At the end of your transfer, DataSync verifies the integrity of your data. Depending on how you configure data verification, this can take a significant amount of time for large datasets.

How DataSync works with open and locked files

Keep in mind the following when trying to transfer files that are open (in use) or locked:

- In general, DataSync can transfer open files without any limitations.
- If a file is open and being written to during a transfer, DataSync can detect this kind of inconsistency during the transfer task's verification phase. To get the latest version of the file, you must run the task again.
- If a file is locked and the server prevents DataSync from opening it, DataSync skips the file during the transfer and logs an error.
- DataSync can't lock or unlock files.

Recurring transfer options

In addition to one-time transfers, DataSync can transfer data on a recurring basis. Some of the options for these situations include:

- Scheduling when your task executes.
- Transferring only the data that's changed since the previous task execution.
- Deleting data in the destination location that's no longer present in the source.

Getting started with AWS DataSync

Before you get started with AWS DataSync, you need to sign up for an AWS account if you don't have one. We also recommend learning where DataSync can be used and how much it might cost to transfer your data.

Sign up for an AWS account

To get started with AWS, you need an AWS account. For information about creating an AWS account, see Getting started with an AWS account in the *AWS Account Management Reference Guide*.

Required IAM permissions for using DataSync

DataSync can transfer your data to or from an Amazon S3 bucket, Amazon EFS file system, or Amazon FSx file system. To get your data where you want it to go, you need the right IAM permissions granted to your identity. For example, the IAM role that you use with DataSync needs permission to use the Amazon S3 operations required to transfer data to an S3 bucket.

You can grant these permissions with IAM policies provided by AWS or by creating your own policies.

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AWS managed policies

AWS provides the following managed policies for common DataSync use cases:

- `AWSDataSyncReadOnlyAccess` – Provides read-only access to DataSync.
- `AWSDataSyncFullAccess` – Provides full access to DataSync and minimal access to its dependencies.

For more information, see AWS managed policies for AWS DataSync.

Customer managed policies

You can create custom IAM policies to use with DataSync. For more information, see IAM customer managed policies for AWS DataSync.

Where can I use DataSync?

For a list of AWS Regions and endpoints that DataSync supports, see AWS DataSync endpoints and quotas in the *AWS General Reference*.

How can I use DataSync?

There are several ways to use DataSync:

- DataSync console, which is part of the AWS Management Console.
- DataSync API or the AWS CLI to programmatically configure and manage DataSync.
- AWS CloudFormation or Terraform to provision your DataSync resources.
- AWS SDKs to build applications that use DataSync.

How much will DataSync cost?

To create a custom estimate using the amount of data that you plan to transfer, see DataSync pricing.

Open-source components used by DataSync

To view the open-source components used by DataSync, download the following link:

- datasync-open-source-components.zip

Do I need an AWS DataSync agent?

To use AWS DataSync, you might need an agent. An *agent* is a virtual machine (VM) appliance that you deploy in your storage environment for data transfers.

Whether you need an agent depends on several factors, including the type of storage you're transferring to or from, if you're transferring across AWS accounts, and which AWS Regions you're transferring between. Before reading further, check that DataSync supports the transfer you're interested in.

After you determine that DataSync supports your transfer scenario, review the following information to help you understand whether you need an agent.

Situations when you need a DataSync agent

Most situations that require a DataSync agent involve storage that's managed by you or another cloud provider.

- Transferring between AWS storage services and on-premises storage
- Transferring between Amazon EFS or Amazon FSx and storage in other clouds
- Transferring between some AWS storage services across AWS accounts (when neither storage service is Amazon S3)
- Transferring between a commercial AWS Region and an AWS GovCloud (US) Region where the source and destination are either Amazon EFS or Amazon FSx

Situations when you don't need a DataSync agent

The situations that don't require an agent apply whether you're transferring in the same AWS Region or across Regions.

- Transferring between AWS storage services in the same AWS account
- Transferring between Amazon S3 and a different AWS storage service across AWS accounts
- Transferring between Amazon S3 and object storage in other clouds
- Transferring between a commercial AWS Region and an AWS GovCloud (US) where either the source or destination is Amazon S3

Choosing an agent for your task mode

DataSync tasks run in Basic mode or Enhanced mode. Basic mode tasks require a Basic mode agent. Enhanced mode tasks require an Enhanced mode agent.

Basic mode supports using an agent when copying to or from the following locations:

- NFS
- SMB
- HDFS
- Object storage (including other clouds)
- Azure blob

Enhanced mode supports using an agent for transfers to or from Amazon S3 with the following locations:

- NFS
- SMB

For more information, see Choosing a task mode for your data transfer.

Using multiple DataSync agents

While most transfers only need one agent, using multiple agents can speed up transfers for large datasets with millions of files or objects. In these situations, we recommend running transfer tasks in parallel, using one agent per task. This approach spreads the transfer workload across multiple tasks, with each task using its own agent. It also helps reduce the time it takes DataSync to prepare and transfer your data. For more information, see Partitioning large datasets with multiple tasks.

Another option—especially if you have millions of small files—is to use multiple agents with a transfer location. For example, you can connect up to four agents to your on-premises Network File System (NFS) file service. This option might speed up your transfer, although the time it takes DataSync to prepare the transfer doesn't change.

With either approach, be mindful that these can increase the I/O operations on your storage and affect your network bandwidth. For more information on using multiple agents for your DataSync transfers, see the AWS Storage Blog.

If you're thinking of using multiple agents, remember the following:

- A location can have up to four Basic mode agents and up to four Enhanced mode agents assigned. A task that uses the location will only use the agents that correspond to the configured task mode.

- Using multiple agents with a location doesn't provide high availability. All the agents associated with a location must be online before you can start your transfer task. If one of the agents is offline, you can't run your task.
- If you're using a virtual private cloud (VPC) service endpoint to communicate with the DataSync service, all the agents must use the same endpoint and subnet.

Next steps

- If you need an agent, review the agent requirements to understand what makes sense for your storage environment.
- If you don't need an agent for your transfer, you can start configuring your transfer.

Requirements for AWS DataSync agents

Before you deploy an AWS DataSync agent in your storage environment, make sure that you understand the agent hypervisor and resource requirements.

Hypervisor requirements

DataSync agents can be deployed on supported hypervisors to facilitate data transfer.

> **Note**
>
> Enhanced mode agents only support VMware ESXi, KVM, Nutanix AHV, and EC2.

You can run a DataSync agent on the following hypervisors:

- **VMware ESXi (version 7.0 or 8.0)**: VMware ESXi is available on the Broadcom website. You also need a VMware vSphere client to connect to the host.
- **Linux Kernel-based Virtual Machine (KVM)**: A free, open-source virtualization technology. KVM is included in Linux versions 2.6.20 and newer. DataSync is tested and supported for the CentOS/RHEL 7 and 8, Ubuntu 16.04 LTS, and Ubuntu 18.04 LTS distributions. Other modern Linux distribution might work, but function or performance is not guaranteed. You must enable hardware accelerated virtualization on your KVM host to deploy your DataSync agent.

We recommend this option if you already have a KVM environment up and running and you're already familiar with how KVM works.

Running KVM on Amazon EC2 isn't supported and can't be used for DataSync agents.

- **Microsoft Hyper-V (version 2012 R2, 2016, or 2019)**: Basic mode agents only. For this setup, you need a Microsoft Hyper-V Manager on a Microsoft Windows client computer to connect to the host.

  The DataSync agent is a generation 1 virtual machine (VM). For more information about the differences between generation 1 and generation 2 VMs, see Should I create a generation 1 or 2 virtual machine in Hyper-V?
- **Amazon EC2**: DataSync provides an Amazon Machine Image (AMI) that contains the DataSync image. For the recommended instance types, see Amazon EC2 instance requirements.

Agent requirements for DataSync transfers

For DataSync transfers, your agent must meet the following resource requirements.

> **Important**
>
> Keep in mind that the Basic mode agent requirements for working with up to 20 million files, objects, or directories are general guidelines. Your agent may need more resources because of other factors, such as how many directories you have and object metadata size. For example, the m5.2xlarge instance for an Amazon EC2 agent still might not be enough for a transfer of less than 20 million files.
> Enhanced mode agents don't have file quotas.

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Virtual machine requirements

When deploying a DataSync agent that isn't on an Amazon EC2 instance, the agent VM requires the following resources, depending upon whether you use a Basic mode agent or an Enhanced mode agent:

Resource	Basic mode	Enhanced mode
Virtual processors	Four virtual processors assigned to the VM	Eight virtual processors assigned to the VM
Disk space	80 GB of disk space for installing the VM image and system data	80 GB of disk space for installing the VM image and system data
RAM	32 GB of RAM assigned to the VM for task executions working with up to 20 million files, objects, or directories 64 GB of RAM assigned to the VM for task executions working with more than 20 million files, objects, or directories	32 GB of RAM assigned to the VM

Amazon EC2 instance requirements

When deploying a DataSync agent on an Amazon EC2 instance, the instance size must be at least 2xlarge. We recommend using one of the following instance sizes, depending upon whether you use a Basic mode agent or an Enhanced mode agent:

Basic mode agent	Enhanced mode agent
For task executions working with up to 20 million files, objects, or directories, use **m5.2xlarge.**	Use **m6a.2xlarge** regardless of the number of files, objects, or directories in your dataset.

Basic mode agent	Enhanced mode agent
For task executions working with more than 20 million files, objects, or directories, use **m5.4xlarge.**	

Agent requirements for AWS Region partitions

DataSync agent images are associated with specific AWS Region partitions. For example, by default you can't download an agent in a commercial AWS Region and then activate it in an AWS GovCloud (US) Region.

Agent management requirements

Once you activate your DataSync agent, AWS manages the agent for you. For more information, see Managing your AWS DataSync agent.

Deploying your AWS DataSync agent

When creating an AWS DataSync agent, the first step is to deploy the agent in your storage environment. You can deploy an agent as a virtual machine (VM) on VMware ESXi, Linux Kernel-based Virtual Machine (KVM), Nutanix AHV (using the KVM image), and Microsoft Hyper-V hypervisors. You also can deploy an agent as an Amazon EC2 instance in a virtual private cloud (VPC) within AWS.

> **Tip**
>
> Before you begin, confirm whether you need a DataSync agent.

Deploying your agent on VMware

You can download an agent from the DataSync console and deploy it in your VMware environment.

Before you begin: Make sure that your storage environment can support a DataSync agent. For more information, see Virtual machine requirements.

To deploy an agent on VMware

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.
3. For **Hypervisor**, choose **VMWare ESXi**, and then choose **Download the image**.

   - The Enhanced mode agent downloads as an `.ova` image file.
   - The Basic mode agent downloads in a `.zip` file that contains the `.ova` image file
4. To minimize network latency, deploy the agent as close as possible to the storage system that DataSync needs to access (the same local network if possible). For more information, see Network requirements for on-premises, self-managed, and other cloud storage.

   If needed, see your hypervisor's documentation on how to deploy an `.ova` file in a VMware host.
5. Power on your hypervisor, log in to the agent VM, and get the agent's IP address. You need this IP address to activate the agent.

   The agent VM's default credentials are login **`admin`** and password **`password`**. If needed, change the password through the VM's local console.

Next step: Choosing a service endpoint for your AWS DataSync agent

Deploying your agent on KVM

You can download an agent from the DataSync console and deploy it in your KVM environment.

Before you begin: Make sure that your storage environment can support a DataSync agent. For more information, see Virtual machine requirements.

To deploy an agent on KVM

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.
3. For **Hypervisor**, choose **Kernel-based Virtual Machine (KVM)**, and then choose **Download the image**.

   - The Enhanced mode agent downloads as an `.qcow2` image file.
   - The Basic mode agent downloads in a `.zip` file that contains the `.qcow2` image file

4. To minimize network latency, deploy the agent as close as possible to the storage system that DataSync needs to access (the same local network if possible). For more information, see Network requirements for on-premises, self-managed, and other cloud storage.
5. Run the following command to install your `.qcow2` image.

   ```
   virt-install \
       --name "datasync" \
       --description "DataSync agent" \
       --os-type=generic \
       --ram=32768 \
       --vcpus=4 \
       --disk path=datasync-yyyymmdd-x86_64.qcow2,bus=virtio,size=80 \
       --network default,model=virtio \
       --graphics none \
       --virt-type kvm \
       --import
   ```

   For information about how to manage this VM and your KVM host, see your hypervisor's documentation.
6. Power on your hypervisor, log in to your VM, and get the IP address of the agent. You need this IP address to activate the agent.

   The agent VM's default credentials are login **`admin`** and password **`password`**. If needed, change the password through the VM's local console.

Next step: Choosing a service endpoint for your AWS DataSync agent

Deploying your Basic mode agent on Microsoft Hyper-V

You can download a Basic mode agent from the DataSync console and deploy it in your Microsoft Hyper-V environment.

Before you begin: Make sure that your storage environment can support a DataSync agent. For more information, see Virtual machine requirements.

To deploy a Basic mode agent on Hyper-V

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.

3. For **Hypervisor**, choose **Microsoft Hyper-V**, and then choose **Download the image**.

   The agent downloads in a `.zip` file that contains a `.vhdx` image file.

4. To minimize network latency, deploy the agent as close as possible to the storage system that DataSync needs to access (the same local network if possible). For more information, see Network requirements for on-premises, self-managed, and other cloud storage.

   If needed, see your hypervisor's documentation on how to deploy a `.vhdx` file in a Hyper-V host.

   > **Warning**
   >
   > You may notice poor network performance if you enable virtual machine queue (VMQ) on a Hyper-V host that's using a Broadcom network adapter. For information about a workaround, see the Microsoft documentation.

5. Power on your hypervisor, log in to your VM, and get the IP address of the agent. You need this IP address to activate the agent.

   The agent VM's default credentials are login **`admin`** and password **`password`**. If needed, change the password through the VM's local console.

Next step: Choosing a service endpoint for your AWS DataSync agent

Deploying your Amazon EC2 agent

You might deploy a DataSync agent as an Amazon EC2 instance when transferring data between:

- A self-managed cloud storage system (for example, an NFS file server in AWS) and an AWS storage service.
- A cloud storage provider (such as Microsoft Azure Blob Storage or Google Cloud Storage) and an AWS storage service using Basic mode.
- An S3 bucket in a commercial AWS Region and an S3 bucket in an AWS GovCloud (US) Region.
- Amazon S3 on AWS Outposts and an AWS storage service using Basic mode.

> **Warning**
>
> We don't recommend using an Amazon EC2 agent with on-premises storage because of increased network latency. Instead, deploy the agent as a VMware, KVM, or Hyper-V virtual machine in your data center as close to your on-premises storage as possible.

Deploying your EC2 agent

To choose the agent AMI for your AWS Region

1. Open a terminal and copy the following AWS CLI command to get the latest DataSync Amazon Machine Image (AMI) ID for the Region where you want to deploy your Amazon EC2 agent.

   Basic mode agents

   ```
   aws ssm get-parameter --name /aws/service/datasync/ami --region your-region
   ```

   Enhanced mode agents

   ```
   aws ssm get-parameter --name /aws/service/datasync/ami/v3 --region your-region
   ```

2. Run the command. In the output, take note of the `"Value"` property with the DataSync AMI ID.

   Example command and output

   ```
   aws ssm get-parameter --name /aws/service/datasync/ami --region us-east-1


   {
       "Parameter": {
           "Name": "/aws/service/datasync/ami",
           "Type": "String",
           "Value": "ami-1234567890abcdef0",
           "Version": 6,
           "LastModifiedDate": 1569946277.996,
           "ARN": "arn:aws:ssm:us-east-1::parameter/aws/service/datasync/ami"
       }
   ```

```
}
```

To deploy your Amazon EC2 agent

> **Tip**
>
> To avoid charges for transferring across Availability Zones, deploy your agent in a way that it doesn't require network traffic between Availability Zones. (To learn more about data transfer prices for all AWS Regions, see Amazon EC2 Data Transfer pricing.)
> For example, deploy your agent in the Availability Zone where your self-managed cloud storage system is located.

1. Copy the following URL:

   ```
   https://console.aws.amazon.com/ec2/v2/home?region=agent-region#LaunchInstanceWizard:ami=ami-id
   ```

   - Replace *agent-region* with the Region where you want to deploy your agent.
   - Replace *ami-id* with the DataSync AMI ID that you obtained.
2. Paste the URL into a browser.

   The Amazon EC2 instance launch page in the AWS Management Console displays.
3. For **Instance type**, choose one of the recommended Amazon EC2 instances for DataSync.
4. For **Key pair**, choose an existing key pair, or create a new one.
5. For **Network settings**, choose **Edit** and then do the following:

   a. For **VPC**, choose a VPC where you want to deploy your agent.

   b. For **Auto-assign public IP**, choose whether you want your agent to be accessible from the public internet.

      You use the instance's public or private IP address later to activate your agent.

   c. For **Firewall (security groups)**, create or a select a security group that does the following:

      - If needed, allows inbound traffic to the Amazon EC2 instance on port 80 (HTTP). Some options for getting an agent activation key require this connection.

- Allows inbound and outbound traffic between the Amazon EC2 instance the storage system that you're transferring data to or from. For more information, see Network requirements for on-premises, self-managed, and other cloud storage.

> **Note**
>
> There are additional ports to configure depending on the type of service endpoint that your agent uses.

6. (Recommended) To increase performance when transferring from a cloud-based file system, expand **Advanced details** and choose a **Placement group** value where your storage is located.
7. Choose **Launch instance** to launch your Amazon EC2 instance.
8. Once your instance status is **Running**, choose the instance.
9. If you configured your instance to be accessible from the public internet, make note of the instance's public IP address. If you didn't, make note of the private IP address.

   You need this IP address when activating your agent.

Examples: Deploying your EC2 agent in an AWS Region

The following guidance can help with common scenarios if you deploy an DataSync agent in an AWS Region.

Topics

- Deploying your Basic mode agent for transfers between cloud storage and AWS storage services
- Deploying your Basic mode agent for transfers between Amazon S3 and AWS file systems

Deploying your Basic mode agent for transfers between cloud storage and AWS storage services

To transfer data between AWS accounts, or between cloud storage systems, the DataSync agent must be located in the same AWS Region and AWS account where the source file system resides. This type of transfer includes the following:

- Transfers between Amazon EFS or Amazon FSx to AWS storage in a different AWS account.
- Transfers from self-managed file systems to AWS storage services.

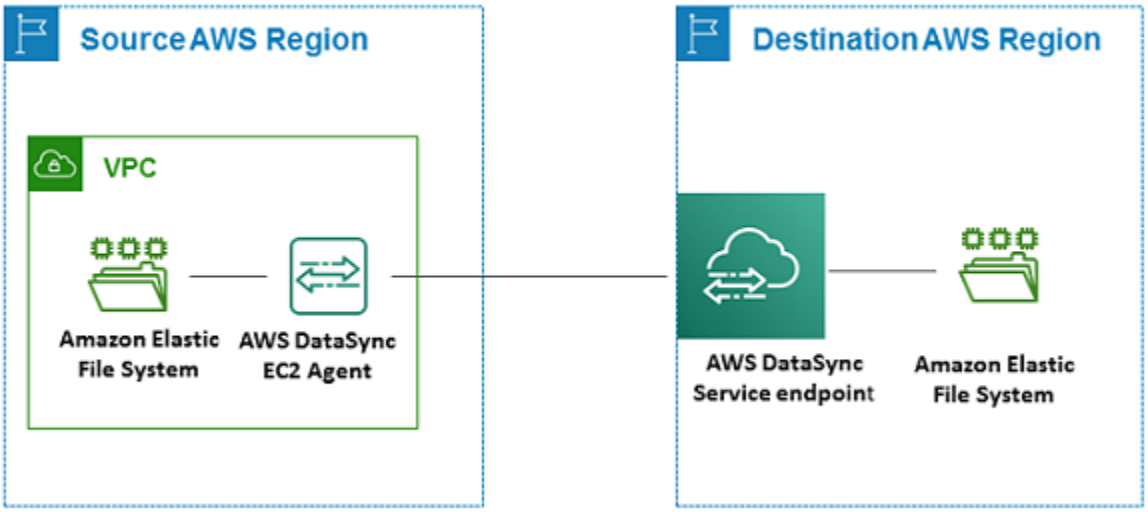
Important

Deploy your agent such that it doesn't require network traffic between Availability Zones (to avoid charges for such traffic).

- To access your Amazon EFS or FSx for Windows File Server file system, deploy the agent in an Availability Zone that has a mount target to your file system.
- For self-managed file systems, deploy the agent in the Availability Zone where your file system resides.

To learn more about data transfer prices for all AWS Regions, see Amazon EC2 On-Demand pricing.

For example, the following diagram shows a high-level view of the DataSync architecture for transferring data from in-cloud Network File System (NFS) to in-cloud NFS or Amazon S3.

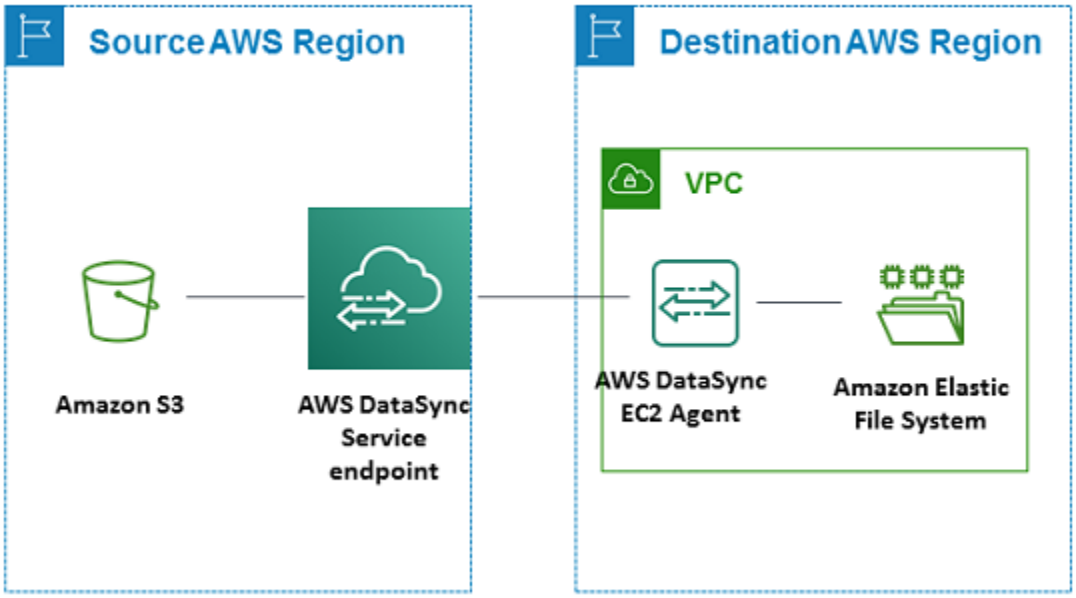


Remember the following when transferring between AWS storage services across AWS accounts:

- When transferring between Amazon EFS file systems or Amazon FSx file systems using the NFS protocol, configure your source file system as an NFS location.
- When transferring between Amazon FSx file systems using the SMB protocol, configure your source file system as an SMB location.

Deploying your Basic mode agent for transfers between Amazon S3 and AWS file systems

The following diagram provides a high-level view of the DataSync architecture for transferring data from Amazon S3 to an AWS file system, such as Amazon EFS or Amazon FSx. You can use this architecture to transfer data from one AWS account to another, or to transfer data from Amazon S3 to a self-managed in-cloud file system.



Deploying your Basic mode agent on AWS Outposts

You can launch a DataSync Amazon EC2 instance on your Outpost. To learn more about launching an AMI on AWS Outposts, see Launch an instance on your Outpost in the *AWS Outposts User Guide*.

When using DataSync to access Amazon S3 on Outposts, you must use a Basic mode agent and launch it in a VPC that's allowed to access your Amazon S3 access point, and activate the agent in the parent Region of the Outpost. The agent must also be able to route to the Amazon S3 on Outposts endpoint for the bucket. To learn more about working with Amazon S3 on Outposts endpoints, see Working with Amazon S3 on Outposts in the *Amazon S3 User Guide*.

Choosing a service endpoint for your AWS DataSync agent

A service endpoint is how your AWS DataSync agent communicates with the DataSync service. DataSync supports the following types of service endpoints:

- **Public service endpoint** – Data is sent over the public internet.

- **Federal Information Processing Standard (FIPS) service endpoint** – Data is sent over the public internet by using processes that comply with FIPS.
- **Virtual private cloud (VPC) service endpoint** – Data is sent through your VPC instead of over the public internet, increasing the security of your transferred data.
- **FIPS VPC service endpoint** – Data is sent through your VPC using processes that comply with FIPS.

You need a service endpoint to activate your agent. When choosing a service endpoint, remember the following:

- An agent can only use one type of endpoint. If you need to transfer data using different endpoint types, create an agent for each type.
- How you connect your storage network to AWS determines what service endpoints you can use.

Choosing a public service endpoint

If you use a public service endpoint, all communication between your DataSync agent and the DataSync service occurs over the public internet.

1. Determine the DataSync public service endpoint that you want to use.
2. Configure your network to allow the traffic required for using DataSync public service endpoints.

Next step: Activating your AWS DataSync agent

Choosing a FIPS service endpoint

DataSync provides some service endpoints that comply with FIPS. For more information, see FIPS endpoints in the *AWS General Reference*.

1. Determine the DataSync FIPS service endpoint that you want to use.
2. Configure your network to allow the traffic required for using DataSync FIPS service endpoints.

Next step: Activating your AWS DataSync agent

Choosing a VPC service endpoint

If you use a VPC service endpoint, your data isn't transferred across the public internet. DataSync instead transfers data through a VPC that's based on the Amazon VPC service.

Contents

How DataSync agents work with VPC service endpoints

VPC service endpoints are provided by AWS PrivateLink. These types of endpoints let you privately connect supported AWS services to your VPC. When you use a VPC service endpoint with DataSync, all communication between your DataSync agent and the DataSync service remains in your VPC.

The VPC service endpoint (along with the network interfaces DataSync creates for data transfer traffic) uses private IP addresses that are only accessible from inside your VPC. For more information, see Connecting your network for AWS DataSync transfers.

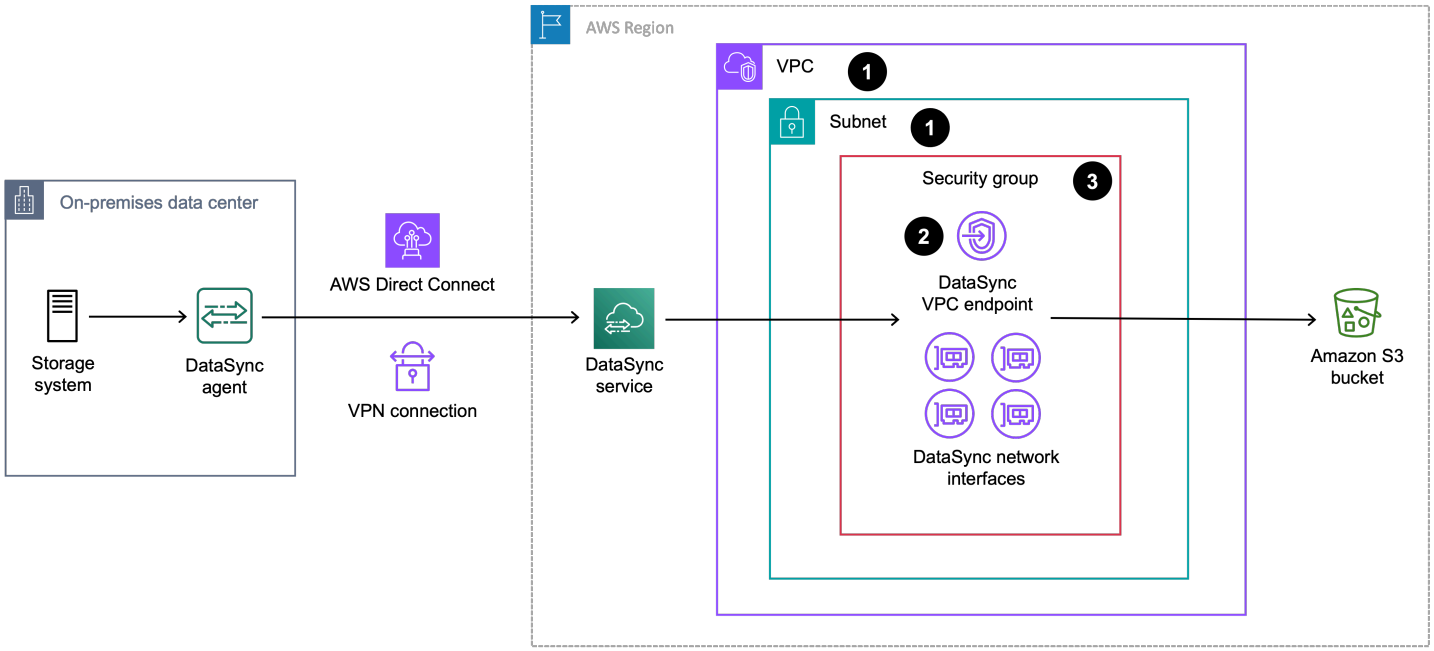
DataSync limitations with VPCs

- VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.
- DataSync doesn't support shared VPCs.

Creating a VPC service endpoint for DataSync

You create a VPC service endpoint for DataSync in a VPC that you manage. Your service endpoint, VPC, and DataSync agent must belong to the same AWS account.

The following diagram shows an example of DataSync using a VPC service endpoint for transferring from an on-premises storage system to an Amazon S3 bucket. The numbered callouts correspond to the steps to create a VPC service endpoint.



To create a VPC service endpoint for DataSync

1. Create or determine a VPC and subnet where you want to create your VPC service endpoint.

   If you're transferring to or from storage that's outside AWS, the VPC should extend to that storage environment (for example, your storage environment might be a data center where your on-premises NFS file server is located). You can do this by using routing rules over Direct Connect or VPN.

2. Create a DataSync VPC service endpoint by doing the following:

   a. Open the Amazon VPC console at https://console.aws.amazon.com/vpc/.

   b. In the left navigation pane, choose **Endpoints**, then choose **Create endpoint**.

   c. For **Service category**, choose **AWS services**.

   d. For **Services**, search for **`datasync`** and choose the endpoint for the AWS Region that you're in (for example, `com.amazonaws.us-east-1.datasync` or `com.amazonaws.us-east-1.datasync-fips`).

   e. For **VPC**, choose the VPC where you want to create the VPC service endpoint.

   f. Expand **Additional settings** and clear the **Enable Private DNS Name** check box to disable this setting.

We recommend disabling this setting in case you have agents in the same VPC that need to use a public service endpoint. An agent can't reach a public service endpoint over the network when this setting is enabled.

g. For **Subnet**, choose the subnet where you want to create the VPC service endpoint. Take note of the subnet ARN (you need this when activating your agent).

h. Choose **Create endpoint**. Take note of the endpoint ID (you need this when activating your agent).

3. In your VPC, configure a security group that allows the traffic required for using DataSync VPC service endpoints. Take note of the security group ARN (you need this when activating your agent).

   The security group must allow your agent to connect with the private IP addresses of the VPC service endpoint and your network interfaces (which get created when you create your task).

Next step: Activating your AWS DataSync agent

Activating your AWS DataSync agent

To finish creating your AWS DataSync agent, you must activate it. This step associates the agent with your AWS account.

> **Note**
>
> You can't activate an agent in more than one AWS account and AWS Region at a time.

Prerequisites

To activate your DataSync agent, make sure that you have the following information:

- The DataSync service endpoint that you're activating your agent with.

  If you're using a VPC service endpoint, you need these details:
  - The VPC service endpoint ID.
  - The subnet where your VPC service endpoint is located.
  - The security group that allows the traffic required for using DataSync VPC service endpoints.

- Your agent's IP address or domain name.

  How you find this depends on the type of agent that you deploy. For example, if your agent is an Amazon EC2 instance, you can find its IP address by going to the instance's page on the Amazon EC2 console.

> **Note**
>
> For FIPS VPC endpoints, use the AWS CLI or DataSync API.

Getting an activation key

You can obtain an activation key for your deployed DataSync agent a few different ways. Some options require access to your agent on port 80 (HTTP). If you use one of these options, DataSync closes the port once you activate the agent.

> **Note**
>
> Agent activation keys expire in 30 minutes if unused.

DataSync console

When activating your agent in the DataSync console, DataSync can get the activation key for you by using the **Automatically get the activation key from your agent** option.

To use this option, your browser must be able to reach your agent on port 80.

Agent local console

Unlike the other options for getting an activation key, this option doesn't require your agent to be accessible on port 80.

1. Log in to the local console of your agent virtual machine (VM) or Amazon EC2 instance.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **0** to get an activation key.
3. Enter the AWS Region that you're activating your agent in.
4. Enter the type of service endpoint type that your agent is using.

5. Copy the activation key that displays.

   For example: `F0EFT-7FPPR-GG7MC-3I9R3-27DOH`

   You specify this key when activating your agent.

CLI

With standard Unix tools, you can run a `curl` request to your agent's IP address to get its activation key.

To use this option, your client must be able to reach your agent on port 80. You can run the following command to check:

```
nc -vz agent-ip-address 80
```

Once you confirm you can reach the agent, run one of the following commands depending on the type of service endpoint that you're using:

- **Public service endpoints**:

  ```
  curl "http://agent-ip-address/?gatewayType=SYNC&activationRegion=your-region&no_redirect"
  ```

- **FIPS service endpoints**:

  ```
  curl "http://agent-ip-address/?gatewayType=SYNC&activationRegion=your-region&endpointType=FIPS&no_redirect"
  ```

- **VPC service endpoints**:

  ```
  curl "http://agent-ip-address/?gatewayType=SYNC&activationRegion=your-region&privateLinkEndpoint=vpc-endpoint-ip-address&endpointType=PRIVATE_LINK&no_redirect"
  ```

- **FIPS VPC service endpoints**:

  ```
  curl "http://agent-ip-address/?gatewayType=SYNC&activationRegion=your-region&privateLinkEndpoint=vpc-endpoint-ip-address&endpointType=FIPS_PRIVATE_LINK&no_redirect"
  ```

> **Note**
>
> To find the *vpc-endpoint-ip-address*, open the Amazon VPC console, choose **Endpoints**, and select your DataSync VPC service endpoint. On the **Subnets** tab, locate the IP address for your VPC service endpoint's subnet. This is the endpoint's IP address.

This command returns an activation key. For example:

```
F0EFT-7FPPR-GG7MC-3I9R3-27DOH
```

You specify this key when activating your agent.

Activating your agent

You have several options for activating your DataSync agent. Once activated, AWS manages the agent for you.

DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.
3. In the **Service endpoint** section, do the following to specify the service endpoint for your agent:
   - For a public service endpoint, choose **Public service endpoints in *your current AWS Region***.
   - For a FIPS service endpoint, choose **FIPS service endpoints in *your current AWS Region***.
   - For a VPC service endpoint, do the following:
     - Choose **VPC endpoints using AWS PrivateLink**.
     - For **VPC endpoint**, choose the VPC service endpoint that you want your agent to use.
     - For **Subnet**, choose the subnet where your VPC service endpoint is located.
     - For **Security group**, choose the security group that allows the traffic required for using DataSync VPC service endpoints.
4. In the **Activation key** section, do one of the following to specify your agent's activation key:

- Choose **Automatically get the activation key from your agent** for DataSync to get the key for you.
  - For **Agent address**, enter your agent's IP address or domain name.
  - Choose **Get key**.

    If activation fails, check your network configuration based on the type of service endpoint you're using.
- Choose **Manually enter your agent's activation key** if you don't want a connection between your browser and agent.
  - Get the key from the agent local console or by using a `curl` command.
  - Back in the DataSync console, enter the key in the **Activation key** field.

5. (Recommended) For **Agent name**, give your agent a name that you can remember.
6. (Optional) For **Tags**, enter values for the **Key** and **Value** fields to tag your agent.

   Tags help you manage, filter, and search for your AWS resources.
7. Choose **Create agent**.
8. On the **Agents** page, verify that your agent is using the correct service endpoint type.

> **Note**
>
> At this point, you might notice that your agent is offline. This happens briefly after activating an agent.

AWS CLI

1. Once you get your activation key, copy one of the following `create-agent` commands depending on the type of service endpoint that you're using:

   - **Public or FIPS service endpoint**:

```
aws datasync create-agent \
  --activation-key activation-key \
  --agent-name name-for-agent
```

   - **VPC or FIPS VPC service endpoint**:

```
aws datasync create-agent \
  --activation-key activation-key \
  --agent-name name-for-agent \
  --vpc-endpoint-id vpc-endpoint-id \
  --subnet-arns subnet-arn \
  --security-group-arns security-group-arn
```

2. For `--activation-key`, specify your agent activation key.
3. (Recommended) For `--agent-name`, specify a name for your agent that you can remember.
4. If you're using a VPC service endpoint, specify the following options:
   - For `--vpc-endpoint-id`, specify the ID of the VPC service endpoint that you're using.
   - For `--subnet-arns`, specify the ARN of the subnet where your VPC service endpoint is located.
   - For `--security-group-arns`, specify the ARN of the security group that allows the traffic required for using DataSync VPC service endpoints.
5. Run the `create-agent` command.

   You get a response with the ARN of the agent that you just activated. For example:

```
{
    "AgentArn": "arn:aws:datasync:us-east-1:111222333444:agent/
agent-0b0addbeef44baca3"
}
```

6. Verify that your agent is activated by running the `list-agents` command:

```
aws datasync list-agents
```

> **Note**
>
> At this point, you might notice that your agent `Status` is `OFFLINE`. This happens briefly after activating an agent.

DataSync API

Once you get your activation key, activate your agent by using the CreateAgent operation.

> **Note**
>
> When you're done, you might notice that your agent is offline. This happens briefly after activating an agent.

Next steps

- Verify your agent's connection to your storage system and the DataSync service.
- If you run into issues trying to activate your agent, get help with troubleshooting.
- Create the DataSync location that you want to use with your agent. This might be an on-premises or other cloud location.

Verifying your agent's network connections

Once you activate your AWS DataSync agent, make sure that the agent has network connectivity to your storage system and the DataSync service.

Accessing your agent's local console

How you access your agent's local console depends on the type of agent you're using.

Accessing the local console (VMware ESXi, Linux KVM, or Microsoft Hyper-V)

For security reasons, you can't remotely connect to the local console of the DataSync agent virtual machine (VM).

- If this is your first time using the local console, log in with the default credentials. The default user name is **`admin`** and the password is **`password`**.

> **Note**
>
> We recommend changing the default password. To do this, on the console main menu enter **5** (or **6** for VMware VMs), then run the `passwd` command to change the password.

Accessing the local console (Amazon EC2)

To connect to an Amazon EC2 agent's local console, you must use SSH.

Before you begin: Make sure that your EC2 instance's security group allows access with SSH (TCP port 22).

1. Open a terminal and copy the following `ssh` command:

   ```
   ssh -i /path/key-pair-name.pem instance-user-name@instance-public-ip-address
   ```

   - For */path/key-pair-name*, specify the path and file name (`.pem`) of the private key required to connect to your instance.
   - For *instance-user-name*, specify `admin`.
   - For *instance-public-ip-address*, specify the public IP address of your instance.
2. Run the `ssh` command to connect to the instance.

Once connected, the main menu of the agent's local console displays.

Verifying your agent's connection to your storage system

Test whether your DataSync agent can connect to your storage system. For more information, see 1. Network connection between your storage system and agent.

1. Access your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **3**.
3. Enter one of the following options:

   a. Enter **1** to test an NFS server connection.

b. Enter **2** to test an SMB server connection.

c. Enter **3** to test an object storage server connection.

d. Enter **4** to test an HDFS connection.

e. Enter **5** to test a Microsoft Azure Blob Storage connection.

4. Enter the storage server's IP address or domain name.

   Remember the following when entering the IP address or domain name:

   - Don't include a protocol. For example, enter **`mystorage.com`** instead of **`https://mystorage.com`**.
   - For HDFS, enter the IP address or domain name of the NameNode or DataNode in the Hadoop cluster.

5. If requested, enter the TCP port for connecting to the storage server (for example, **443**).

See if the connectivity test **PASSED** or **FAILED**.

Verifying your agent's connection to the DataSync service

Test whether your DataSync agent can connect to the DataSync service. For more information, see 2. Network connection between your agent and DataSync service.

1. Access your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **2** to begin testing network connectivity.

   If your agent is activated, the **Test Network Connectivity** option can be initiated without any additional user input, because the Region and endpoint type are taken from the activated agent information.

3. Enter the type of DataSync service endpoint that your agent uses:

   a. For public service endpoints, enter **1** and the AWS Region where your agent is activated.

   b. For FIPS service endpoints, enter **2** and the Region where your agent is activated.

   c. For VPC service endpoints, enter **3**.

   d. For FIPS VPC service endpoints, enter **4**.

   You see a **PASSED** or **FAILED** message.

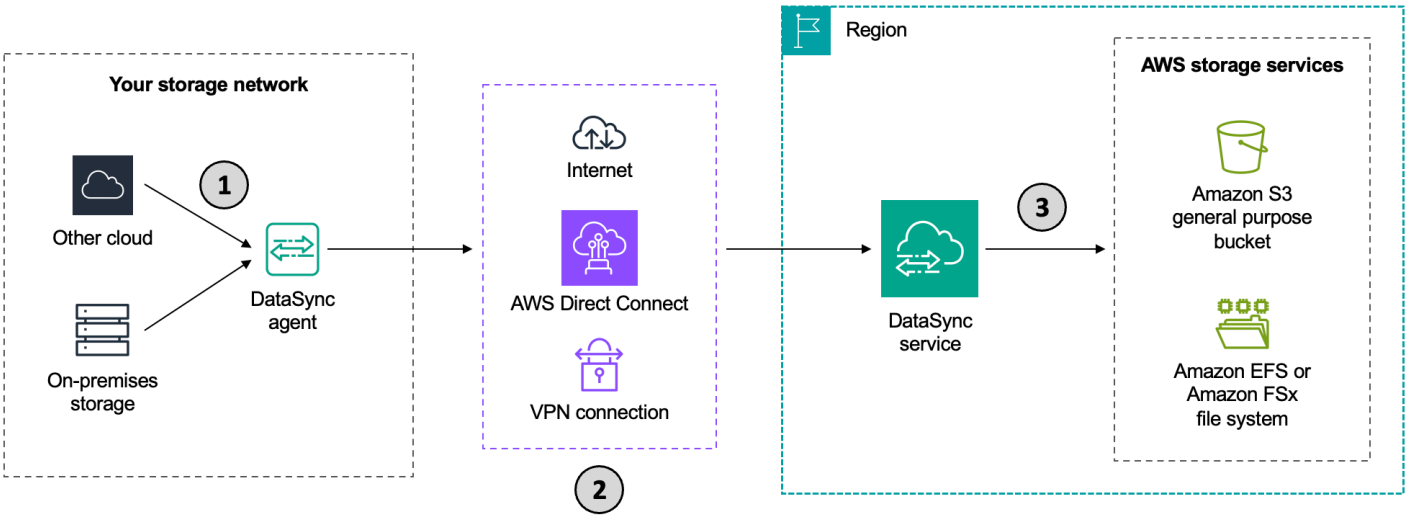
4. If you see a **FAILED** message, check your network configuration. For more information, see AWS DataSync network requirements.

Next steps

Create the DataSync location that you want to use with your agent. This might be an on-premises or other cloud location.

Connecting your network for AWS DataSync transfers

If you need an AWS DataSync agent, you must establish several network connections for a data transfer. The following diagram shows the three network connections in a DataSync transfer from a storage system (which could be on premises, in another cloud, or at the edge) to an AWS storage service.



1. Network connection between your storage system and agent

Your DataSync agent connects to your on-premises storage or storage in other clouds. For more information, see Network requirements for on-premises, self-managed, and other cloud storage.

2. Network connection between your agent and DataSync service

There are a few aspects to connecting your agent to the DataSync service. First, you must establish network connectivity between your storage location and AWS. Second, your agent needs a service endpoint to communicate with DataSync.

Contents

Connecting your storage network to AWS

When using DataSync, consider the following options for connecting your storage network to AWS:

- **Direct Connect** - With Direct Connect, you can create a dedicated connection between your storage network and AWS. From a DataSync perspective, this lets you:
  - Transfer data over a private path to your virtual private cloud (VPC), which avoids routing over the public internet.
  - Get a more predictable connection than using a virtual private network (VPN) to connect your storage network to AWS (particularly if your agent is an Amazon EC2 instance).
  - Use any type of DataSync service endpoint, including public, Federal Information Processing Standard (FIPS), or VPC endpoints.

  For more information, see DataSync architecture and routing examples with Direct Connect.
- **VPN** - You can connect your storage network to AWS by using a VPN (such as AWS Site-to-Site VPN).
- **Public internet** - You can connect your storage network directly to DataSync over the internet by using a public or FIPS service endpoint.

Choosing a service endpoint

Your agent uses a service endpoint to communicate with DataSync. For more information, see Choosing a service endpoint for your AWS DataSync agent.

3. Network connection between DataSync service and AWS storage service

To connect DataSync to an AWS storage service, you just have to make sure that the DataSync service can access your S3 bucket or file system. For more information, see Network requirements for AWS storage services.

Networking when you don't need a DataSync agent

For transfers that don't require a DataSync agent, you just have to make sure that the DataSync service can access the AWS storage systems you're transferring between. For more information, see Network requirements for AWS storage services.

How and where DataSync traffic flows through the network

DataSync has *data plane* and *control plane* traffic. Knowing how each of these flows through the network is important if you want to separate your DataSync traffic.

- **Data plane traffic** – Includes the file or object data moving between your storage locations. In most cases, data plane traffic routes through network interfaces that DataSync automatically generates and manages when you create a task. Where these network interfaces get created depends on the type of AWS storage service you're transferring to or from and the service endpoint that your DataSync agent uses.
- **Control plane traffic** – Includes management activities for your DataSync resources. This traffic routes through the service endpoint that your agent uses.

Network security for DataSync

For information about how your storage data (including metadata) is secured during a transfer, see AWS DataSync encryption in transit.

AWS DataSync network requirements

Configuring your network is an important step in setting up AWS DataSync. Your network configuration depends on several factors, such as what kind of storage systems you're working with. It's also based on what kind of DataSync service endpoint that you plan to use.

IPv6 support

DataSync has dual-stack support for compatibility with both IPv4 and IPv6 networks. IPv6 support is available in all AWS Regions where the service is offered. DataSync supports using IPv6 addresses with the following data sources:

- Elastic File System (EFS)
- Network File System (NFS)
- Server Message Block (SMB)
- Object storage

IPv6-compatible agents for on-premises storage

In order to use DataSync in an IPv6 network environment, you need to use IPv6-compatible agents. These agents support both IPv4 and IPv6 connectivity, adapting to various network environments.

- For IPv6-only networks – no configuration changes required.
- For IPv4-only networks – no configuration changes required.
- For dual-stack (both IPv4 and IPv6) networks – let the agent select the protocol or manually configure it based on your preference.

Considerations for dual-stack networks

You can customize your agent's behavior through the local console in the following ways:

- Disable IPv6 so the agent cannot use IPv6 to reach local filesystems or the DataSync service.
- Set the agent's IP version to use for data transfers:
  - Set to IPv6 so that the agent will only use IPv6 for data transfers.
  - Set IPv4 so that the agent will only use IPv4 for data transfers.
  - Set to Auto (restores the default) so that the agent will automatically choose the protocol version (IPv4 or IPv6) for data transfers.

For more information about managing agent IP version settings, see the section called “Performing maintenance on your agent”.

> **Important**
>
> Agents built from images downloaded before July 16, 2025 do not support IPv6.

Network requirements for on-premises, self-managed, and other cloud storage

The following network requirements can apply to on-premises, self-managed, and other cloud storage systems. These are typically storage systems that you manage or might be managed by another cloud provider.

Note

Depending on your network, you might need to allow traffic on ports other than what's listed here for your DataSync agent to connect with your storage.

From	To	Protocol	Port	How it's used by DataSync
DataSync agent	NFS file server	TCP	2049 (for NFS versions 4.1 and 4.0) 111 and 2049 (for NFS version 3.x)	Mounts the NFS file server. DataSync supports NFS versions 3.x, 4.0, and 4.1.
DataSync agent	SMB file server	TCP	139 or 445	Mounts the SMB file server. DataSync supports SMB versions 1.0 and later. For security reasons, we recommend using SMB version 3.0.2 or later. Earlier versions, such as SMB 1.0, contain known security vulnerabilities that attackers can exploit to compromise your data.

From	To	Protocol	Port	How it's used by DataSync
DataSync agent	Object storage	TCP	443 (HTTPS) or 80 (HTTP) **Note** Depend on your object storage you might need to allow traffic on nonstandard HTTPS and HTTP ports (such as 8443 or 8080).	Accesses your Amazon S3-compatible object storage on-premises or in other clouds.

From	To	Protocol	Port	How it's used by DataSync
DataSync agent	Hadoop cluster	TCP	NameNode port (default is 8020) In most clusters, you can find this port number in the `core-site.xml` file under the `fs.default` or `fs.default.name` property (depending on the Hadoop distribution).	Accesses the NameNodes in your Hadoop cluster. Specify the port used when creating an HDFS location.

From	To	Protocol	Port	How it's used by DataSync
DataSync agent	Hadoop cluster	TCP	DataNode port (default is 50010) In most clusters, you can find this port number in the `hdfs-site.xml` file under the `dfs.datanode.address` property.	Accesses the DataNodes in your Hadoop cluster. The DataSync agent automatically determines the port to use.
DataSync agent	Hadoop Key Management Server (KMS)	TCP	KMS port (default is 9600)	Accesses the KMS for your Hadoop cluster.
DataSync agent	Kerberos Key Distribution Center (KDC) server	TCP	KDC port (default is 88)	Authenticates with the Kerberos realm. This port is used only with HDFS and SMB locations that use Kerberos authentication.
DataSync agent	Storage system's management interface	TCP	Depends on your network	Connects to your storage system.

Network requirements for AWS storage services

The network ports required for DataSync to connect to an AWS storage service during a transfer vary.

From	To	Protocol	Port
DataSync service	Amazon EFS	TCP	2049
DataSync service	FSx for Windows File Server	See file system access control for FSx for Windows File Server.	
DataSync service	FSx for Lustre	See file system access control for FSx for Lustre.	
DataSync service	FSx for OpenZFS	See file system access control for FSx for OpenZFS.	
DataSync service	FSx for ONTAP	TCP	111, 635, and 2049 (NFS) 445 (SMB)
DataSync service	Amazon S3	N/A (DataSync connects to S3 buckets on your behalf)	

Network requirements for public or FIPS service endpoints

Your DataSync agent requires the following network access when using public or FIPS service endpoints. If you use a firewall or router to filter or limit network traffic, configure your firewall or router to allow these endpoints.

From	To	Protocol	Port	How it's used	Endpoints accessed
Your web browser	DataSync agent	TCP	80 (HTTP)	Allows your browser to obtain the DataSync	N/A

From	To	Protocol	Port	How it's used	Endpoints accessed
				agent's activation key. Once activated, DataSync closes the agent's port 80. Your agent doesn't require port 80 to be publicly accessible. The required level of access to port 80 depends on your network configuration. **Note** You can get the activation key without a connection between your browser and agent. For	

From	To	Protocol	Port	How it's used	Endpoints accessed
				more information, see Getting an activation key.	
DataSync agent	Amazon CloudFront	TCP	443 (HTTPS)	Helps bootstrap your DataSync agent prior to activation.**Only required for Basic mode agents**.	**AWS Regions**: • `d3dvvaliwoko8h.cloudfront.net` **AWS GovCloud (US) Regions**: • `s3.us-gov-west-1.amazonaws.com/fmrsendpoints-endpointsbucket-go4p5gpna6sk`
DataSync agent	AWS	TCP	443 (HTTPS)	Activates your DataSync agent and associates it with your AWS account. You can block the public endpoint after activation.	The *`activation-region`* is the AWS Region where you activate your DataSync agent. **Public endpoint activation**: • `activation.datasync.` *`activation-region`*`.amazonaws.com` **FIPS endpoint activation**: • `activation.datasync-fips.` *`activation-region`*`.amazonaws.com`

From	To	Protocol	Port	How it's used	Endpoints accessed
DataSync agent	AWS	TCP	443 (HTTPS)	Allows communication between the DataSync agent and DataSync service endpoint. For informati on, see Choosing a service endpoint for your AWS DataSync agent.	The *activation-region* is the AWS Region where you activate your DataSync agent. Depending on what you're using DataSync for, you might not need to allow access to every endpoint listed here. **DataSync control plane endpoints**: • **Public endpoint**: `cp.datasync.` *activation-region* `.amazonaws.com` • **FIPS endpoint**: `cp.datasync-fips.` *activation-region* `.amazonaws.com` **DataSync data plane endpoint** (for transfer tasks only): • **Basic mode agents**: *your-task-id* `.datasync-dp.` *activation-region* `.amazonaws.com` **Enhanced mode agents**: **.*.your-task-id.** `.datasync-dp.` *activation-region* `.amazonaws.com`

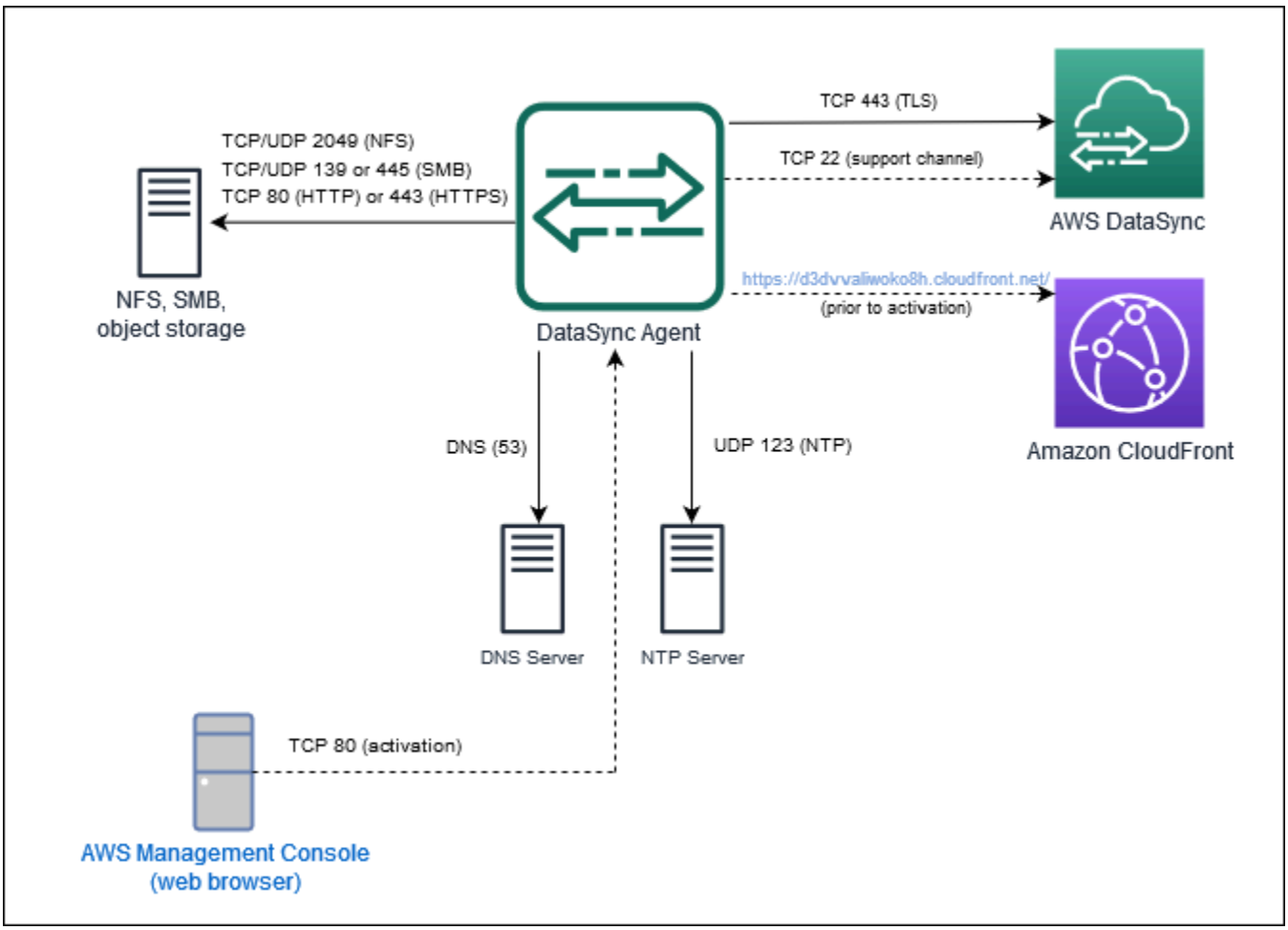
From	To	Protocol	Port	How it's used	Endpoints accessed
Your client	AWS	TCP	443 (HTTPS)	Allows you to make DataSync API requests.	The *activation-region* is the AWS Region where you activate your DataSync agent. **Public endpoint**: • `datasync.` *activation-region*`.amazonaws.com` **FIPS endpoint**: • `datasync-fips.` *activation-region* `.amazonaws.com`

From	To	Protocol	Port	How it's used	Endpoints accessed
DataSync agent	AWS	TCP	443 (HTTPS)	Allows the DataSync agent to get updates from AWS. For more information, see Managing your AWS DataSync agent.	The *activation-region* is the AWS Region where you activate your DataSync agent. **Basic mode agents**: • amazonlinux.default.amazonaws.com • cdn.amazonlinux.com • amazonlinux-2-repos-*activation-region*.s3.dualstack.*activation-region*.amazonaws.com • amazonlinux-2-repos-*activation-region*.s3.*activation-region*.amazonaws.com • *.s3.*activation-region*.amazonaws.com • *.s3.dualstack.*activation-region*.amazonaws.com **Enhanced mode agents**: • *.s3.dualstack.*activation-region*.amazonaws.com

From	To	Protocol	Port	How it's used	Endpoints accessed
DataSync agent	Domain Name Service (DNS) server	TCP/ UDP	53 (DNS)	Allows communication between the DataSync agent and DNS server.	N/A
DataSync agent	AWS	TCP	22 (Support channel)	Allows AWS Support to access your DataSync agent to help you troubleshoot issues. You don't need this port open for normal operation.	**Basic mode agents**: • **Commercial Regions**: `54.201.223.107` • **GovCloud Regions**: `52.222.99.142` **Enhanced mode agents**: • **Commercial Regions**: `support.datasync.us-east-1.amazonaws.com` • **GovCloud Regions**: `support.datasync.us-gov-west-1.amazonaws.com`

From	To	Protocol	Port	How it's used	Endpoints accessed
DataSync agent	Network Time Protocol (NTP) server	UDP	123 (NTP)	Allows local systems to synchronize the VM time to the host time.	**NTP:** • `0.amazon.pool.ntp.org` • `1.amazon.pool.ntp.org` • `2.amazon.pool.ntp.org` • `3.amazon.pool.ntp.org` **Note** To change the default NTP configuration of your VM agent to use a different NTP server using the local console, see View and manage agent system time server configuration.

The following diagram shows the ports required by DataSync when using public or FIPS service endpoints.



Network requirements for VPC or FIPS VPC service endpoints

A virtual private cloud (VPC) endpoint provides a private connection between your agent and AWS that doesn't cross the internet or use public IP addresses. This also helps prevent packets from entering or exiting the network. For more information, see Choosing a VPC service endpoint.

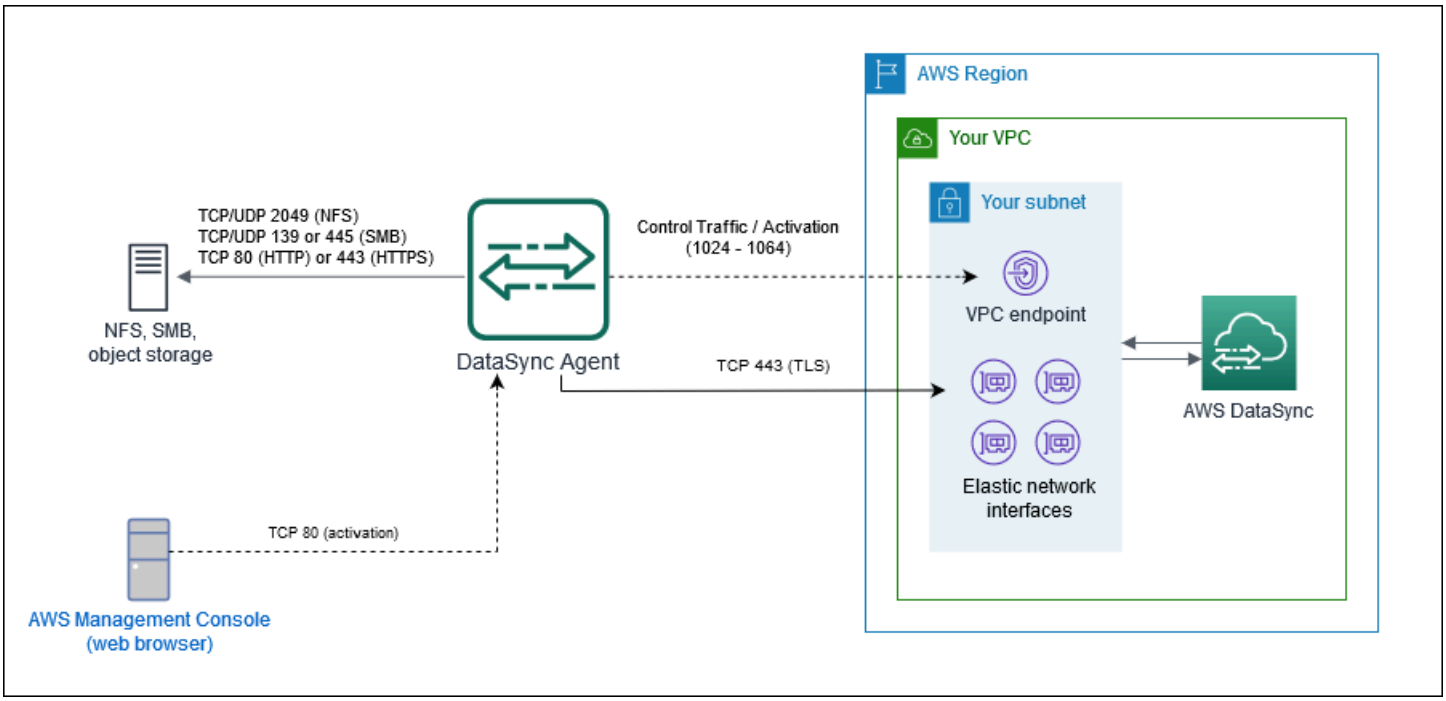
DataSync requires the following ports for your agent to use a VPC service endpoint.

From	To	Protocol	Port	How it's used
Your web browser	Your DataSync agent	TCP	80 (HTTP)	Allows your browser to obtain the agent activation key. Once activated, DataSync closes the agent's port 80.

From	To	Protocol	Port	How it's used
				Your agent doesn't require port 80 to be publicly accessible. The required level of access to port 80 depends on your network configuration. **Note** You can get the activation key without a connection between your browser and agent. For more information, see Getting an activation key.
DataSync agent	Your DataSync VPC service endpoint To find the endpoint's IP address, open the Amazon VPC console, choose **Endpoints**, and select your DataSync VPC service endpoint. On the **Subnets** tab, locate the IP address for your VPC service endpoint's subnet. This is the endpoint's IP address.	TCP	1024-1064	For control plane traffic.

From	To	Protocol	Port	How it's used
DataSync agent	Your DataSync task's network interfaces To find the IP addresses of these interfaces, see Viewing your network interfaces.	TCP	443 (HTTPS)	For data plane traffic.
DataSync agent	Your DataSync VPC service endpoint	TCP	22 (Support channel)	To allow AWS Support to access your DataSync agent for troubleshooting.**Only required for Basic mode agents**. You don't need this port open for normal operation.

The following diagram shows the ports required by DataSync when using VPC service endpoints.



Network interfaces for AWS DataSync transfers

For every task you create, AWS DataSync automatically generates and manages network interfaces for data transfer traffic. How many network interfaces DataSync creates and where they're created depends on the following details about your transfer task:

- Whether your task requires a DataSync agent.
- Your source and destination locations (where you're copying data from and to).
- The type of service endpoint that your agent uses.

Each network interface uses a single IP address in your subnet (the more network interfaces there are, the more IP addresses you need). Use the following tables to make sure your subnet has enough IP addresses for your task.

Network interfaces for transfers with agents

In general, you need a DataSync agent when copying data between an AWS storage service and storage system that isn't AWS.

Location	Network interfaces created by default	Where network interfaces are created when using a public or FIPS endpoint	Where network interfaces are created when using a private (VPC) endpoint
Amazon S3	4	N/A[1]	The subnet you specify when activating your DataSync agent.
Amazon EFS	4	The subnet you specify when creating the Amazon EFS location.	
Amazon FSx for Windows File Server	4	The same subnet as the file system's preferred file server.	

Location	Network interfaces created by default	Where network interfaces are created when using a public or FIPS endpoint	Where network interfaces are created when using a private (VPC) endpoint
Amazon FSx for Lustre	4	The same subnet as the file system.	
Amazon FSx for OpenZFS	4	The same subnet as the file system.	
Amazon FSx for NetApp ONTAP	4	The same subnet as the file system.	

[1] Network interfaces aren't needed because the DataSync service communicates directly with the S3 bucket.

Network interfaces for transfers without agents

You don’t need a DataSync agent when copying data between AWS services.

The total number of network interfaces depends on the DataSync locations in your transfer. For example, transferring between Amazon EFS and FSx for Lustre file systems requires four network interfaces. Meanwhile, transferring between FSx for Windows File Server and an S3 bucket requires two network interfaces.

Location	Network interfaces created by default	Where network interfaces are created
Amazon S3	N/A[1]	N/A[1]
Amazon EFS	2	The subnet you specify when creating the Amazon EFS location.

Location	Network interfaces created by default	Where network interfaces are created
FSx for Windows File Server	2	The same subnet as the preferred file server for the file system.
FSx for Lustre	2	The same subnet as the file system.
FSx for OpenZFS	2	The same subnet as the file system.
FSx for ONTAP	2	The same subnet as the file system.

[1] Network interfaces aren't needed because the DataSync service communicates directly with the S3 bucket.

Viewing your network interfaces

To see the network interfaces allocated to your DataSync transfer task, do one of the following:

- Use the DescribeTask operation. The operation returns `SourceNetworkInterfaceArns` and `DestinationNetworkInterfaceArns` with responses that look like this:

  ```
  arn:aws:ec2:your-region:your-account-id:network-interface/eni-f012345678abcdef0
  ```

  In this example, the network interface ID is `eni-f012345678abcdef0`.
- In the Amazon EC2 console, search for your task ID (such as `task-f012345678abcdef0`) to find its network interfaces.

DataSync architecture and routing examples with Direct Connect

Consider the following network architectures when using Direct Connect with your AWS DataSync transfers.

Tip

If your network uses a transit gateway, we recommend separating your DataSync transfer's logical path to optimize costs (particularly if you're migrating a large amount of data). For example, if you use AWS Transit Gateway for normal traffic between your on-premises networks and virtual private clouds (VPCs), you can configure your network so that DataSync traffic bypasses the transit gateway and its data processing charges.

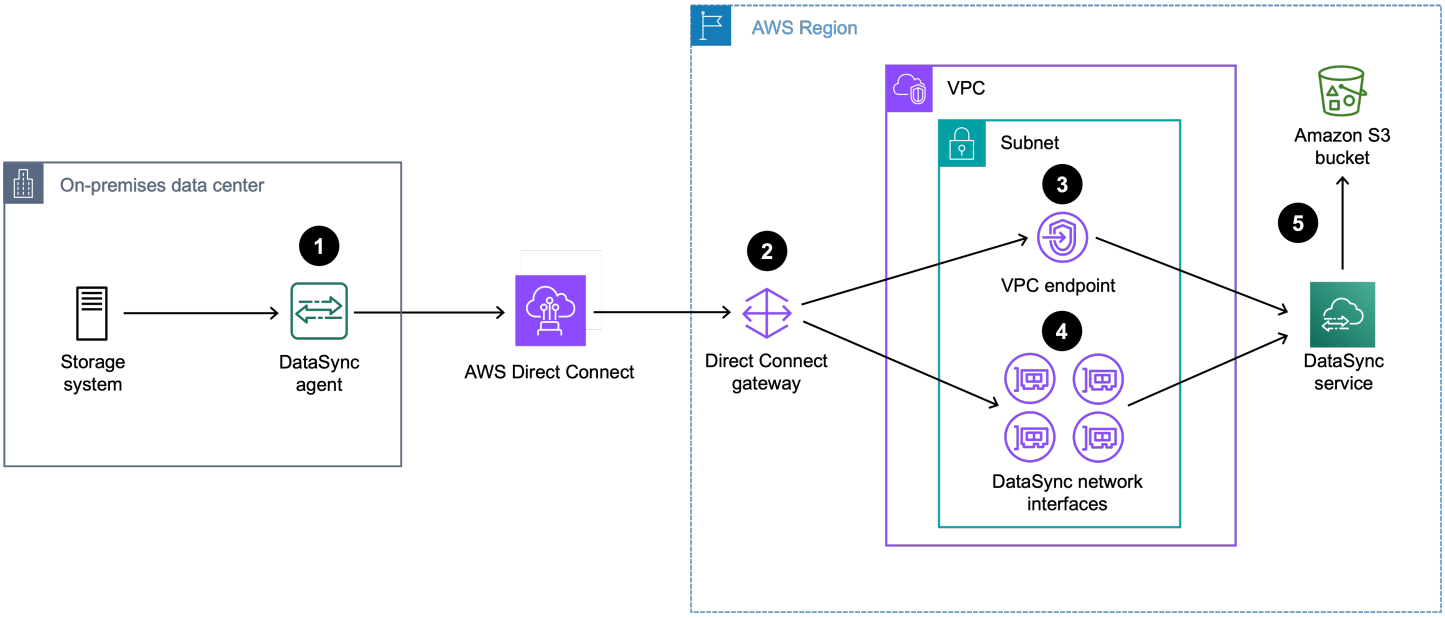
Using Direct Connect with a DataSync VPC service endpoint

If your DataSync agent uses a VPC service endpoint, you need a Direct Connect gateway to connect to your VPC.

Contents

Direct Connect architecture with VPC endpoint and S3 destination

The following Direct Connect architecture shows a DataSync transfer from an on-premises storage system to an S3 bucket.

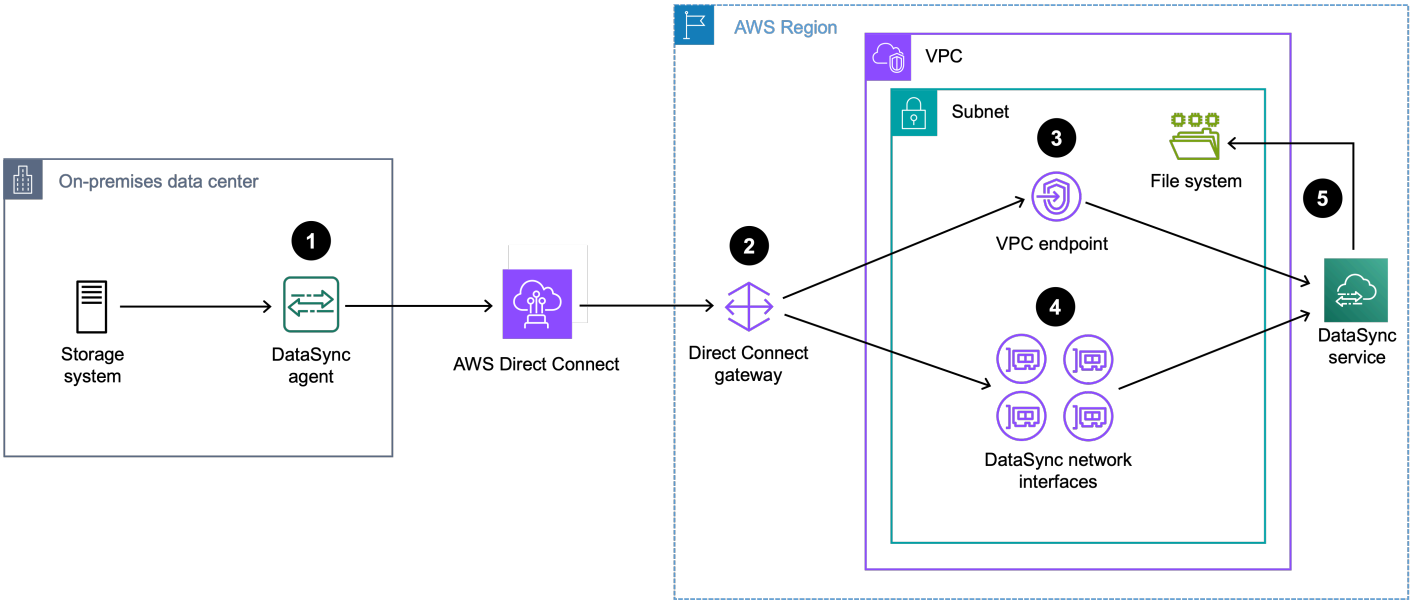


1. The DataSync agent routes DataSync traffic from the on-premises storage system (source location) to the Direct Connect connection.
2. DataSync traffic routes to a Direct Connect gateway that's used for your transfer. To set this up, you must:
   a. Associate the Direct Connect gateway with a virtual private gateway for the VPC. This is the VPC where the DataSync VPC endpoint is located and where the DataSync task creates network interfaces.
   b. Create a private virtual interface that connects this VPC to the Direct Connect gateway.
3. DataSync traffic (control plane) routes through the DataSync VPC endpoint.
4. DataSync traffic (data plane) routes through the DataSync network interfaces in the subnet that you specify when creating the DataSync agent.
5. DataSync traffic routes through the DataSync service to the S3 bucket (destination location).

Direct Connect architecture with VPC endpoint and file system destination in same subnet

When transferring to or from an Amazon EFS or Amazon FSx file system, your file system and DataSync VPC endpoint can be in the same subnet.

The following Direct Connect architecture shows a DataSync transfer from an on-premises storage system to an Amazon EFS or Amazon FSx file system.

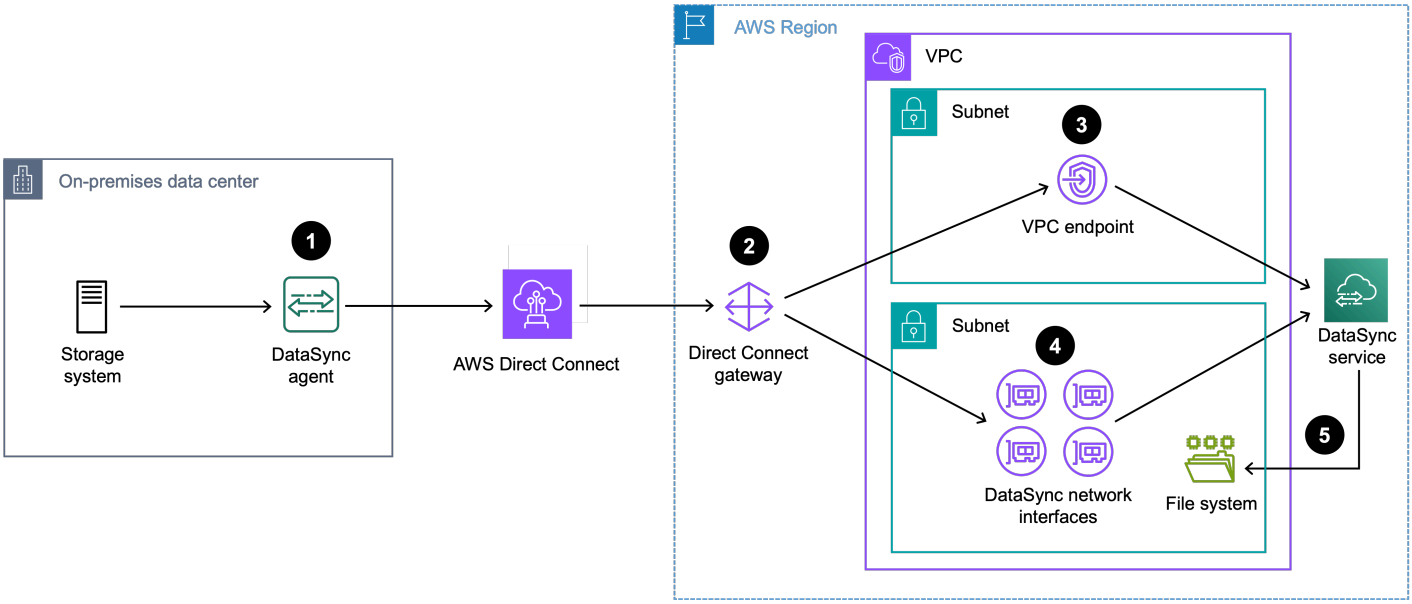


1. The DataSync agent routes DataSync traffic from the on-premises storage system (source location) to the Direct Connect connection.
2. DataSync traffic routes to a Direct Connect gateway that's used for your transfer. To set this up, you must:
   a. Associate the Direct Connect gateway with a virtual private gateway for the VPC. This is the VPC where the DataSync VPC endpoint is located and where the DataSync task creates network interfaces for the file system (destination location).
   b. Create a private virtual interface that connects this VPC to the Direct Connect gateway.
3. DataSync traffic (control plane) routes through the DataSync VPC endpoint.
4. DataSync traffic (data plane) routes through the DataSync network interfaces in the file system's subnet. This is the same subnet where the DataSync VPC endpoint is located.
5. DataSync traffic routes through the DataSync service to the file system (destination location).

Direct Connect architecture with VPC endpoint and file system destination in different subnets

When transferring to or from an Amazon EFS or Amazon FSx file system, your file system and DataSync VPC endpoint can be in different subnets.

The following Direct Connect architecture shows a DataSync transfer from an on-premises storage system to an Amazon EFS or Amazon FSx file system.



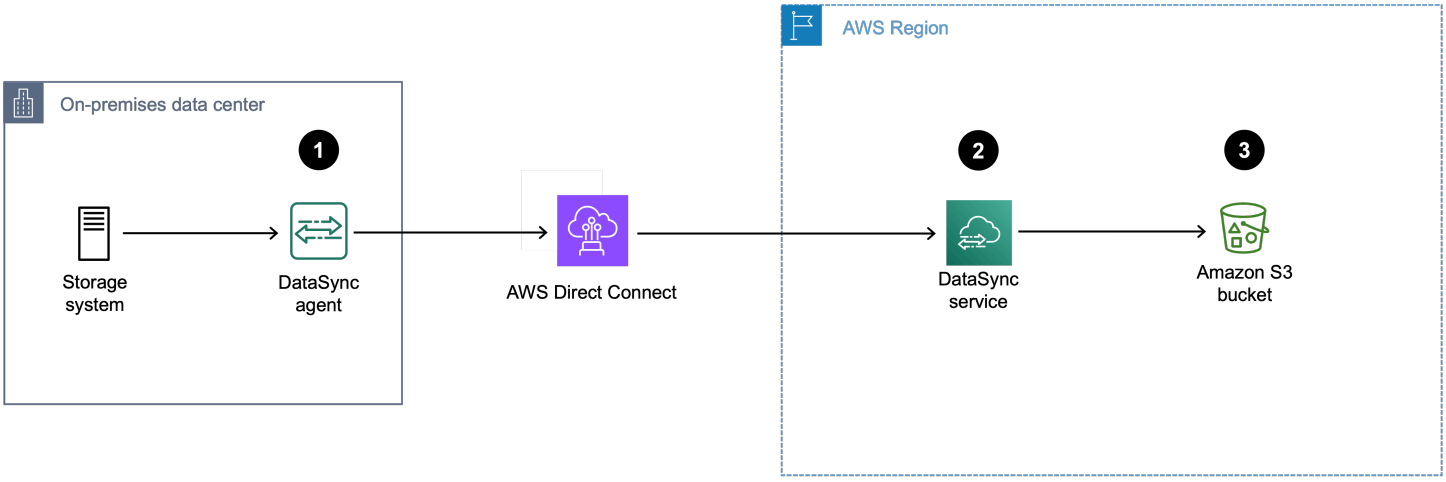
1. The DataSync agent routes DataSync traffic from the on-premises storage system (source location) to the Direct Connect connection.
2. DataSync traffic routes to a Direct Connect gateway that's used for your transfer. To set this up, you must:
   a. Associate the Direct Connect gateway with a virtual private gateway for the VPC. This is the VPC where the DataSync VPC endpoint is located and where the DataSync task creates network interfaces for the file system (destination location).
   b. Create a private virtual interface that connects these VPCs to the Direct Connect gateway.
3. DataSync traffic (control plane) routes through the DataSync VPC endpoint.
4. DataSync traffic (data plane) routes through the DataSync network interfaces in the file system's subnet. This is a different subnet than where the DataSync VPC endpoint is located.
5. DataSync traffic routes through the DataSync service to the file system (destination location).

Using Direct Connect with a DataSync public or FIPS service endpoint

If your DataSync agent uses a public or Federal Information Processing Standard (FIPS) service endpoint, you can route your data transfer traffic through a Direct Connect connection by using a public virtual interface.

While Direct Connect advertises all local and remote AWS Region prefixes by default, you can use BGP community tags to control the scope (Regional or global) and route preference of traffic on the public virtual interface. You must advertise at least one public prefix to create your DataSync agent.

The following Direct Connect architecture shows a DataSync transfer from an on-premises storage system through a public or FIPS endpoint to an S3 bucket.



1. The DataSync agent routes DataSync traffic from the on-premises storage system (source location) to the Direct Connect connection.
2. DataSync traffic routes to the DataSync service through a public virtual interface.
3. DataSync traffic to the S3 bucket (destination location).

Next steps

If you need a DataSync agent and haven't created one yet, deploy the agent, choose a service endpoint for the agent, and then activate the agent.

Once you create the agent, you can configure your network for DataSync.

Configuring your AWS DataSync agent for multiple NICs

If you configure your AWS DataSync agent to use multiple network adapters (NICs), the agent can be accessed by more than one IP address. You might want to do this in the following situations:

- **Maximizing throughput** – You might want to maximize throughput to an agent when network adapters are a bottleneck.
- **Network isolation** – Your Network File System (NFS), Server Message Block (SMB), Hadoop Distributed File System (HDFS), or object storage server might reside on a virtual LAN (VLAN) that lacks internet connectivity for security reasons.

In a typical multiple-adapter use case, one adapter is configured as the route by which the agent communicates with AWS (as the default agent). Except for this one adapter, NFS, SMB, HDFS, or self-managed object storage locations must be in the same subnet as the adapter that connects to them.

Otherwise, communication with the intended NFS, SMB, HDFS, or object storage locations might not be possible. In some cases, you might configure an NFS, SMB, HDFS, or object storage location on the same adapter that's used for communication with AWS. In these cases, NFS, SMB, HDFS, or object storage traffic for that server and AWS traffic flows through the same adapter.

In some cases, you might configure one adapter to connect to the AWS DataSync console and then add a second adapter. In such a case, DataSync automatically configures the route table to use the second adapter as the preferred route.

Transferring your data with AWS DataSync

With AWS DataSync, you can transfer data to or from storage that's on-premises, in AWS, or in other clouds.

Setting up a DataSync transfer generally involves the following steps:

1. Determine if DataSync supports your transfer.
2. If you need a DataSync agent for your transfer, deploy and activate an agent as close as possible to one of your storage systems.

   For example, if you're transferring from an on-premises Network File System (NFS) file server, deploy the agent as close as you can to that file server.
3. Provide DataSync access to your storage system.

   DataSync needs permission to read from or write to your storage (depending on whether your storage is a source or destination location). For example, learn how to provide DataSync access to NFS file servers.
4. Connect your network for traffic between your storage system and DataSync.
5. Create a location for your source storage system by using the DataSync console, AWS CLI, or DataSync API.

   For example, learn how to create an NFS location or Amazon S3 location.
6. Repeat steps 3-5 to create your transfer's destination location.
7. Create and start a DataSync transfer task that includes your source and destination locations.

Topics

Where can I transfer my data with AWS DataSync?

Where you can transfer your data with AWS DataSync depends on the following factors:

- Your transfer's source and destination locations
- If your locations are in different AWS accounts
- If your locations are in different AWS Regions
- If your are using Basic mode or Enhanced mode

Supported transfers in the same AWS account

DataSync supports transfers between the following storage resources that are associated with the same AWS account.

Source	Destination	Requires an agent?	Supported task mode
• NFS • SMB	• Amazon S3	Yes	Basic, Enhanced
• NFS • SMB	• Amazon EFS • Amazon FSx	Yes	Basic only
• HDFS • Object Storage	• Amazon S3 • Amazon EFS • Amazon FSx	Yes	Basic only
• Other cloud storage	• Amazon S3	Only for Basic mode	Basic, Enhanced
• Other cloud storage	• Amazon EFS • Amazon FSx	Yes	Basic only
• Amazon S3	• Amazon S3	No	Basic, Enhanced
• Amazon S3	• Amazon EFS	No	Basic only

Source	Destination	Requires an agent?	Supported task mode
	• Amazon FSx		
• Amazon S3	• NFS • SMB	Yes	Basic, Enhanced
• Amazon S3	• HDFS • Object Storage	Yes	Basic only
• Amazon S3	• Other cloud storage	Only for Basic mode	Basic, Enhanced
• Amazon EFS • Amazon FSx	• NFS • SMB	Yes	Basic only
• Amazon EFS • Amazon FSx	• HDFS • Object Storage	Yes	Basic only
• Amazon EFS • Amazon FSx	• Other cloud storage	Yes	Basic only
• Amazon EFS • Amazon FSx	• Amazon S3	No	Basic only
• Amazon EFS • Amazon FSx	• Amazon EFS • Amazon FSx	No	Basic only
• S3 on Outposts	• S3 (in AWS Regions)	Yes	Basic only
• Amazon S3 (in AWS Regions)	• S3 on Outposts	Yes	Basic only

Supported transfers across AWS accounts

DataSync supports some transfers between storage resources that are associated with different AWS accounts.

Source	Destination	Requires an agent?	Supported task mode
• NFS • SMB	• Amazon S3	Yes	Basic, Enhanced
• HDFS • Object Storage	• Amazon S3	Yes	Basic only
• Amazon S3	• Amazon S3	No	Basic, Enhanced
• Amazon S3	• Amazon EFS • Amazon FSx	No	Basic only
• Amazon S3	• NFS • SMB	Yes	Basic, Enhanced
• Amazon S3	• HDFS • Object Storage	Yes	Basic only
• Amazon EFS • Amazon FSx	• Amazon S3	No	Basic only
• Amazon EFS[1] • Amazon FSx for OpenZFS[1] • Amazon FSx for Windows File Server[2] • Amazon FSx for NetApp ONTAP[3]	• Amazon EFS • Amazon FSx	Yes (when used as an NFS/SMB location)	Basic only

[1] Configured as an NFS location.

[2] Configured as an SMB location.

[3] Configured as an NFS or SMB location.

Supported transfers in the same AWS Region

There are no restrictions when transferring data within the same AWS Region (including opt-in Regions). For more information, see AWS Regions supported by DataSync.

Supported transfers between AWS Regions

Note the following when transferring data between AWS Regions supported by DataSync:

- When transferring between AWS storage services in different AWS Regions, one of the two locations must be in the Region where you're using DataSync.
- You can't transfer across Regions with an NFS, SMB, HDFS, or object storage location. In these situations, both of your transfer locations must be in the same Region where you activate your DataSync agent.
- With AWS GovCloud (US) Regions, you can:
  - Transfer between the AWS GovCloud (US-East) and AWS GovCloud (US-West) Regions.
  - Transfer between an AWS GovCloud (US) Region and commercial AWS Region, such as US East (N. Virginia). This type of transfer requires an agent when transferring between Amazon EFS or Amazon FSx file systems.

> **Important**
>
> You pay for data transferred between AWS Regions. This transfer is billed as data transfer out from the source to destination Region. For more information, see AWS DataSync Pricing.

Determining if your transfer requires a DataSync agent

Depending on your transfer scenario, you might need a DataSync agent. For more information, see Do I need an AWS DataSync agent?

Transferring to or from on-premises storage with AWS DataSync

With AWS DataSync, you can transfer files and objects between a number of on-premises or self-managed storage systems and the following AWS storage services:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

Topics

Configuring AWS DataSync transfers with an NFS file server

With AWS DataSync, you can transfer data between your Network File System (NFS) file server and the following AWS storage services. Supported storage services depend on your task mode, as shown below:

Basic mode	Enhanced mode
• Amazon S3 • Amazon EFS • Amazon FSx for Windows File Server • Amazon FSx for Lustre • Amazon FSx for OpenZFS • Amazon FSx for NetApp ONTAP	• Amazon S3

To set up this kind of transfer, you create a location for your NFS file server. You can use this location as a transfer source or destination.

Providing DataSync access to NFS file servers

For DataSync to access your NFS file server, you need a DataSync agent. The agent mounts an export on your file server by using the NFS protocol. Be sure to use the agent that corresponds to your desired task mode.

Topics

- Configuring your NFS export
- Supported NFS versions

Configuring your NFS export

The export that DataSync needs for your transfer depends on if your NFS file server is a source or destination location and how your file server's permissions are configured.

If your file server is a source location, DataSync just has to read and traverse your files and folders. If it's a destination location, DataSync needs root access to write to the location and set ownership, permissions, and other metadata on the files and folders that you're copying. You can use the `no_root_squash` option to allow root access for your export.

The following examples describe how to configure an NFS export that provides access to DataSync.

When your NFS file server is a source location (root access)

Configure your export by using the following command, which provides DataSync read-only permissions (`ro`) and root access (`no_root_squash`):

```
export-path datasync-agent-ip-address(ro,no_root_squash)
```

When your NFS file server is a destination location

Configure your export by using the following command, which provides DataSync write permissions (`rw`) and root access (`no_root_squash`):

```
export-path datasync-agent-ip-address(rw,no_root_squash)
```

When your NFS file server is a source location (no root access)

Configure your export by using the following command, which specifies the POSIX user ID (UID) and group ID (GID) that you know would provide DataSync read-only permissions on the export:

```
export-path datasync-agent-ip-address(ro,all_squash,anonuid=uid,anongid=gid)
```

Supported NFS versions

By default, DataSync uses NFS version 4.1. DataSync also supports NFS 4.0 and 3.x.

Configuring your network for NFS transfers

For your DataSync transfer, you must configure traffic for a few network connections:

1. Allow traffic on the following ports from your DataSync agent to your NFS file server:

   - **For NFS version 4.1 and 4.0** – TCP port 2049
   - **For NFS version 3.x** – TCP ports 111 and 2049

   Other NFS clients in your network should be able to mount the NFS export that you're using to transfer data. The export must also be accessible without Kerberos authentication.
2. Configure traffic for your service endpoint connection (such as a VPC, public, or FIPS endpoint).
3. Allow traffic from the DataSync service to the AWS storage service you're transferring to or from.

Creating your NFS transfer location

Before you begin, note the following:

- You need an NFS file server that you want to transfer data from.
- You need a DataSync agent that can access your file server.
- DataSync doesn't support copying NFS version 4 access control lists (ACLs).

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Network File System (NFS)**.
4. For **Agents**, choose the DataSync agent that can connect to your NFS file server.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.
5. For **NFS server**, enter the Domain Name System (DNS) name or IP address of the NFS file server that your DataSync agent connects to.
6. For **Mount path**, enter the NFS export path that you want DataSync to mount.

   This path (or a subdirectory of the path) is where DataSync transfers data to or from. For more information, see Configuring your NFS export.
7. (Optional) Expand **Additional settings** and choose a specific **NFS version** for DataSync to use when accessing your file server.

   For more information, see Supported NFS versions.
8. (Optional) Choose **Add tag** to tag your NFS location.

   Tags are key-value pairs that help you manage, filter, and search for your locations. We recommend creating at least a name tag for your location.
9. Choose **Create location**.

Using the AWS CLI

- Use the following command to create an NFS location.

  ```
  aws datasync create-location-nfs \
      --server-hostname nfs-server-address \
      --on-prem-config AgentArns=datasync-agent-arns \
      --subdirectory nfs-export-path
  ```

  For more information on creating the location, see Providing DataSync access to NFS file servers.

  DataSync automatically chooses the NFS version that it uses to read from an NFS location. To specify an NFS version, use the optional `Version` parameter in the NfsMountOptions API operation.

This command returns the Amazon Resource Name (ARN) of the NFS location, similar to the ARN shown following.

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:111222333444:location/
loc-0f01451b140b2af49"
}
```

To make sure that the directory can be mounted, you can connect to any computer that has the same network configuration as your agent and run the following command.

```
mount -t nfs -o nfsvers=<nfs-server-version <nfs-server-address:<nfs-export-path <test-
folder
```

The following is an example of the command.

```
mount -t nfs -o nfsvers=3 198.51.100.123:/path_for_sync_to_read_from /
temp_folder_to_test_mount_on_local_machine
```

Configuring AWS DataSync transfers with an SMB file server

With AWS DataSync, you can transfer data between your Server Message Block (SMB) file server and the following AWS storage services. Supported storage services depend on your task mode, as shown below:

Basic mode	Enhanced mode
• Amazon S3 • Amazon EFS • Amazon FSx for Windows File Server • Amazon FSx for Lustre • Amazon FSx for OpenZFS • Amazon FSx for NetApp ONTAP	• Amazon S3

To set up this kind of transfer, you create a location for your SMB file server. You can use this as a transfer source or destination. Be sure to use the agent that corresponds to your desired task mode.

Providing DataSync access to SMB file servers

DataSync connects to your file server using the SMB protocol and can authenticate with NTLM or Kerberos.

Topics

Supported SMB versions

By default, DataSync automatically chooses a version of the SMB protocol based on negotiation with your SMB file server.

You also can configure DataSync to use a specific SMB version, but we recommend doing this only if DataSync has trouble negotiating with the SMB file server automatically. DataSync supports SMB versions 1.0 and later. For security reasons, we recommend using SMB version 3.0.2 or later. Earlier versions, such as SMB 1.0, contain known security vulnerabilities that attackers can exploit to compromise your data.

See the following table for a list of options in the DataSync console and API:

Console option	API option	Description
Automatic	`AUTOMATIC`	DataSync and the SMB file server negotiate the highest version of SMB that they mutually support between 2.1 and 3.1.1. This is the default and recommended option. If you instead choose a specific version that your file server doesn't support, you may get an `Operation Not Supported` error.
SMB 3.0.2	`SMB3`	Restricts the protocol negotiation to only SMB version 3.0.2.

Console option	API option	Description
SMB 2.1	`SMB2`	Restricts the protocol negotiation to only SMB version 2.1.
SMB 2.0	`SMB2_0`	Restricts the protocol negotiation to only SMB version 2.0.
SMB 1.0	`SMB1`	Restricts the protocol negotiation to only SMB version 1.0.

Using NTLM authentication

To use NTLM authentication, you provide a user name and password that allows DataSync to access the SMB file server that you're transferring to or from. The user can be a local user on your file server or a domain user in your Microsoft Active Directory.

Using Kerberos authentication

To use Kerberos authentication, you provide a Kerberos principal, Kerberos key table (keytab) file, and Kerberos configuration file that allows DataSync to access the SMB file server that you're transferring to or from.

Topics

- Prerequisites
- DataSync configuration options for Kerberos

Prerequisites

You need to create a couple Kerberos artifacts and configure your network so that DataSync can access your SMB file server.

- Create a Kerberos keytab file by using the ktpass or kutil utility.

  The following example creates a keytab file by using `ktpass`. The Kerberos realm that you specify (`MYDOMAIN.ORG`) must be upper case.

```
ktpass /out C:\YOUR_KEYTAB.keytab /princ HOST/kerberosuser@MYDOMAIN.ORG /mapuser
 kerberosuser /pass * /crypto AES256-SHA1 /ptype KRB5_NT_PRINCIPAL
```

- Prepare a simplified version of the Kerberos configuration file (`krb5.conf`). Include information about the realm, the location of the domain admin servers, and mappings of hostnames onto a Kerberos realm.

  Verify that the `krb5.conf` content is formatted with the correct mixed casing for the realms and domain realm names. For example:

```
[libdefaults]
  dns_lookup_realm = true
  dns_lookup_kdc = true
  forwardable = true
  default_realm = MYDOMAIN.ORG

[realms]
  MYDOMAIN.ORG = {
    kdc = mydomain.org
    admin_server = mydomain.org
  }

[domain_realm]
  .mydomain.org = MYDOMAIN.ORG
  mydomain.org = MYDOMAIN.ORG
```

- In your network configuration, make sure that your Kerberos Key Distribution Center (KDC) server port is open. The KDC port is typically TCP port 88.

DataSync configuration options for Kerberos

When creating an SMB location that uses Kerberos, you configure the following options.

Console option	API option	Description
SMB server	`ServerHostName`	The domain name of the SMB file server that your DataSync agent will mount. For Kerberos, you can't

Console option	API option	Description
		specify the file server's IP address.
Kerberos principal	`KerberosPrincipal`	An identity in your Kerberos realm that has permission to access the files, folders, and file metadata in your SMB file server. A Kerberos principal might look like `HOST/kerberosuser@MYDOMAIN.ORG` . Principal names are case sensitive.
Keytab file	`KerberosKeytab`	A Kerberos key table (keytab) file, which includes mappings between your Kerberos principal and encryption keys.
Kerberos configuration file	`KerberosKrbConf`	A `krb5.conf` file that defines your Kerberos realm configuration.
DNS IP addresses (optional)	`DnsIpAddresses`	The IPv4 addresses for the DNS servers that your SMB file server belongs to. If you have multiple domains in your environment, configuring this makes sure that DataSync connects to the right SMB file server.

Required permissions

The identity that you provide DataSync must have permission to mount and access your SMB file server's files, folders, and file metadata.

If you provide an identity in your Active Directory, it must be a member of an Active Directory group with one or both of the following user rights (depending the metadata that you want DataSync to copy):

User right	Description
Restore files and directories (`SE_RESTORE_NAME`)	Allows DataSync to copy object ownership, permissions, file metadata, and NTFS discretionary access lists (DACLs). This user right is usually granted to members of the **Domain Admins** and **Backup Operators** groups (both of which are default Active Directory groups).
Manage auditing and security log (`SE_SECURITY_NAME`)	Allows DataSync to copy NTFS system access control lists (SACLs). This user right is usually granted to members of the **Domain Admins** group.

If you want to copy Windows ACLs and are transferring between an SMB file server and another storage system that uses SMB (such as Amazon FSx for Windows File Server or FSx for ONTAP), the identity that you provide DataSync must belong to the same Active Directory domain or have an Active Directory trust relationship between their domains.

DFS Namespaces

DataSync doesn't support Microsoft Distributed File System (DFS) Namespaces. We recommend specifying an underlying file server or share instead when creating your DataSync location.

Creating your SMB transfer location

Before you begin, you need an SMB file server that you want to transfer data from.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Server Message Block (SMB)**.

   You configure this location as a source or destination later.
4. For **Agents**, choose the DataSync agent that can connect to your SMB file server.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.
5. For **SMB server**, enter the domain name or IP address of the SMB file server that your DataSync agent will mount.

   Remember the following with this setting:

   - You can't specify an IP version 6 (IPv6) address.
   - If you're using Kerberos authentication, you must specify a domain name.
6. For **Share name**, enter the name of the share exported by your SMB file server where DataSync will read or write data.

   You can include a subdirectory in the share path (for example, `/path/to/subdirectory`). Make sure that other SMB clients in your network can also mount this path.

   To copy all the data in the subdirectory, DataSync must be able to mount the SMB share and access all of its data. For more information, see Required permissions.
7. (Optional) Expand **Additional settings** and choose an **SMB Version** for DataSync to use when accessing your file server.

   By default, DataSync automatically chooses a version based on negotiation with the SMB file server. For information, see Supported SMB versions.
8. For **Authentication type**, choose **NTLM** or **Kerberos**.
9. Do one of the following depending on your authentication type:

   NTLM

   - For **User**, enter a user name that can mount your SMB file server and has permission to access the files and folders involved in your transfer.

For more information, see Required permissions.

- For **Password**, enter the password of the user who can mount your SMB file server and has permission to access the files and folders involved in your transfer.
- (Optional) For **Domain**, enter the Windows domain name that your SMB file server belongs to.

  If you have multiple domains in your environment, configuring this setting makes sure that DataSync connects to the right SMB file server.

Kerberos

- For **Kerberos principal**, specify a principal in your Kerberos realm that has permission to access the files, folders, and file metadata in your SMB file server.

  A Kerberos principal might look like `HOST/kerberosuser@MYDOMAIN.ORG`.

  Principal names are case sensitive. Your DataSync task execution will fail if the principal that you specify for this setting doesn't exactly match the principal that you use to create the keytab file.
- For **Keytab file**, upload a keytab file that includes mappings between your Kerberos principal and encryption keys.
- For **Kerberos configuration file**, upload a `krb5.conf` file that defines your Kerberos realm configuration.
- (Optional) For **DNS IP addresses**, specify up to two IPv4 addresses for the DNS servers that your SMB file server belongs to.

  If you have multiple domains in your environment, configuring this parameter makes sure that DataSync connects to the right SMB file server.

10. (Optional) Choose **Add tag** to tag your SMB location.

    Tags are key-value pairs that help you manage, filter, and search for your locations. We recommend creating at least a name tag for your location.
11. Choose **Create location**.

Using the AWS CLI

The following instructions describe how to create SMB locations with NTLM or Kerberos authentication.

NTLM

1. Copy the following `create-location-smb` command.

```
aws datasync create-location-smb \
    --agent-arns datasync-agent-arns \
    --server-hostname smb-server-address \
    --subdirectory smb-export-path \
    --authentication-type "NTLM" \
    --user user-who-can-mount-share \
    --password user-password \
    --domain windows-domain-of-smb-server
```

2. For `--agent-arns`, specify the DataSync agent that can connect to your SMB file server.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.

3. For `--server-hostname`, specify the domain name or IPv4 address of the SMB file server that your DataSync agent will mount.

4. For `--subdirectory`, specify the name of the share exported by your SMB file server where DataSync will read or write data.

   You can include a subdirectory in the share path (for example, `/path/to/subdirectory`). Make sure that other SMB clients in your network can also mount this path.

   To copy all the data in the subdirectory, DataSync must be able to mount the SMB share and access all of its data. For more information, see Required permissions.

5. For `--user`, specify a user name that can mount your SMB file server and has permission to access the files and folders involved in your transfer.

   For more information, see Required permissions.

6. For `--password`, specify the password of the user who can mount your SMB file server and has permission to access the files and folders involved in your transfer.

7. (Optional) For `--domain`, specify the Windows domain name that your SMB file server belongs to.

   If you have multiple domains in your environment, configuring this setting makes sure that DataSync connects to the right SMB file server.

8. (Optional) Add the `--version` option if you want DataSync to use a specific SMB version. For more information, see Supported SMB versions.

9. Run the `create-location-smb` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "arn:aws:datasync:us-east-1:123456789012:location/loc-01234567890example"
}
```

Kerberos

1. Copy the following `create-location-smb` command.

```
aws datasync create-location-smb \
    --agent-arns datasync-agent-arns \
    --server-hostname smb-server-address \
    --subdirectory smb-export-path \
    --authentication-type "KERBEROS" \
    --kerberos-principal "HOST/kerberosuser@EXAMPLE.COM" \
    --kerberos-keytab "fileb://path/to/file.keytab" \
    --kerberos-krb5-conf "file://path/to/krb5.conf" \
    --dns-ip-addresses array-of-ipv4-addresses
```

2. For `--agent-arns`, specify the DataSync agent that can connect to your SMB file server.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.

3. For `--server-hostname`, specify the domain name of the SMB file server that your DataSync agent will mount.

4. For `--subdirectory`, specify the name of the share exported by your SMB file server where DataSync will read or write data.

You can include a subdirectory in the share path (for example, `/path/to/subdirectory`). Make sure that other SMB clients in your network can also mount this path.

To copy all the data in the subdirectory, DataSync must be able to mount the SMB share and access all of its data. For more information, see Required permissions.

5. For the Kerberos options, do the following:

   - `--kerberos-principal`: Specify a principal in your Kerberos realm that has permission to access the files, folders, and file metadata in your SMB file server.

     A Kerberos principal might look like `HOST/kerberosuser@MYDOMAIN.ORG`.

     Principal names are case sensitive. Your DataSync task execution will fail if the principal that you specify for this option doesn't exactly match the principal that you use to create the keytab file.
   - `--kerberos-keytab`: Specify a keytab file that includes mappings between your Kerberos principal and encryption keys.
   - `--kerberos-krb5-conf`: Specify a `krb5.conf` file that defines your Kerberos realm configuration.
   - (Optional) `--dns-ip-addresses`: Specify up to two IPv4 addresses for the DNS servers that your SMB file server belongs to.

     If you have multiple domains in your environment, configuring this parameter makes sure that DataSync connects to the right SMB file server.

6. (Optional) Add the `--version` option if you want DataSync to use a specific SMB version. For more information, see Supported SMB versions.
7. Run the `create-location-smb` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "arn:aws:datasync:us-east-1:123456789012:location/loc-01234567890example"
}
```

Configuring AWS DataSync transfers with an HDFS cluster

With AWS DataSync, you can transfer data between your Hadoop Distributed File System (HDFS) cluster and one of the following AWS storage services using Basic mode tasks:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

To set up this kind of transfer, you create a location for your HDFS cluster. You can use this location as a transfer source or destination.

Providing DataSync access to HDFS clusters

To connect to your HDFS cluster, DataSync uses a Basic mode agent agent that you deploy as close as possible to your HDFS cluster. The DataSync agent acts as an HDFS client and communicates with the NameNodes and DataNodes in your cluster.

When you start a transfer task, DataSync queries the NameNode for locations of files and folders on the cluster. If you configure your HDFS location as a source location, DataSync reads files and folder data from the DataNodes in your cluster and copies that data to the destination. If you configure your HDFS location as a destination location, then DataSync writes files and folders from the source to the DataNodes in your cluster.

Authentication

When connecting to an HDFS cluster, DataSync supports simple authentication or Kerberos authentication. To use simple authentication, provide the user name of a user with rights to read and write to the HDFS cluster. To use Kerberos authentication, provide a Kerberos configuration file, a Kerberos key table (keytab) file, and a Kerberos principal name. The credentials of the Kerberos principal must be in the provided keytab file.

Encryption

When using Kerberos authentication, DataSync supports encryption of data as it's transmitted between the DataSync agent and your HDFS cluster. Encrypt your data by using the Quality of

Protection (QOP) configuration settings on your HDFS cluster and by specifying the QOP settings when creating your HDFS location. The QOP configuration includes settings for data transfer protection and Remote Procedure Call (RPC) protection.

DataSync supports the following Kerberos encryption types:

- `des-cbc-crc`
- `des-cbc-md4`
- `des-cbc-md5`
- `des3-cbc-sha1`
- `arcfour-hmac`
- `arcfour-hmac-exp`
- `aes128-cts-hmac-sha1-96`
- `aes256-cts-hmac-sha1-96`
- `aes128-cts-hmac-sha256-128`
- `aes256-cts-hmac-sha384-192`
- `camellia128-cts-cmac`
- `camellia256-cts-cmac`

You can also configure HDFS clusters for encryption at rest using Transparent Data Encryption (TDE). When using simple authentication, DataSync reads and writes to TDE-enabled clusters. If you're using DataSync to copy data to a TDE-enabled cluster, first configure the encryption zones on the HDFS cluster. DataSync doesn't create encryption zones.

Unsupported HDFS features

The following HDFS capabilities aren't currently supported by DataSync:

- Transparent Data Encryption (TDE) when using Kerberos authentication
- Configuring multiple NameNodes
- Hadoop HDFS over HTTP (HttpFS)
- POSIX access control lists (ACLs)
- HDFS extended attributes (xattrs)

- HDFS clusters using Apache HBase

Creating your HDFS transfer location

You can use your location as a source or destination for your DataSync transfer.

Before you begin: Verify network connectivity between your agent and Hadoop cluster by doing the following:

- Test access to the TCP ports listed in Network requirements for on-premises, self-managed, and other cloud storage.
- Test access between your local agent and your Hadoop cluster. For instructions, see Verifying your agent's connection to your storage system.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Hadoop Distributed File System (HDFS)**.

   You can configure this location as a source or destination later.
4. For **Agents**, choose the agent that can connect to your HDFS cluster.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.
5. For **NameNode**, provide the domain name or IP address of your HDFS cluster's primary NameNode.
6. For **Folder**, enter a folder on your HDFS cluster that you want DataSync to use for the data transfer.

   If your HDFS location is a source, DataSync copies the files in this folder to the destination. If your location is a destination, DataSync writes files to this folder.
7. To set the **Block size** or **Replication factor**, choose **Additional settings**.

   The default block size is 128 MiB. The block sizes that you provide must be a multiple of 512 bytes.

   The default replication factor is three DataNodes when transferring to the HDFS cluster.

8. In the **Security** section, choose the **Authentication type** used on your HDFS cluster.

   - **Simple** – For **User**, specify the user name with the following permissions on the HDFS cluster (depending on your use case):
     - If you plan to use this location as a source location, specify a user that only has read permissions.
     - If you plan to use this location as a destination location, specify a user that has read and write permissions.

     Optionally, specify the URI of the Key Management Server (KMS) of your HDFS cluster.
   - **Kerberos** – Specify the Kerberos **Principal** with access to your HDFS cluster. Next, provide the **KeyTab file** that contains the provided Kerberos principal. Then, provide the **Kerberos configuration file**. Finally, specify the type of encryption in transit protection in the **RPC protection** and **Data transfer protection** dropdown lists.
9. (Optional) Choose **Add tag** to tag your HDFS location.

   Tags are key-value pairs that help you manage, filter, and search for your locations. We recommend creating at least a name tag for your location.
10. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-hdfs` command.

```
aws datasync create-location-hdfs --name-nodes [{"Hostname":"host1", "Port": 8020}]
 \
    --authentication-type "SIMPLE|KERBEROS" \
    --agent-arns [arn:aws:datasync:us-east-1:123456789012:agent/
agent-01234567890example] \
    --subdirectory "/path/to/my/data"
```

2. For the `--name-nodes` parameter, specify the hostname or IP address of your HDFS cluster's primary NameNode and the TCP port that the NameNode is listening on.
3. For the `--authentication-type` parameter, specify the type of authentication to use when connecting to the Hadoop cluster. You can specify `SIMPLE` or `KERBEROS`.

   If you use `SIMPLE` authentication, use the `--simple-user` parameter to specify the user name of the user. If you use `KERBEROS` authentication, use the `--kerberos-principal`, `--`

`kerberos-keytab`, and `--kerberos-krb5-conf` parameters. For more information, see create-location-hdfs.

4. For the `--agent-arns` parameter, specify the ARN of the DataSync agent that can connect to your HDFS cluster.

   You can choose more than one agent. For more information, see Using multiple DataSync agents.

5. (Optional) For the `--subdirectory` parameter, specify a folder on your HDFS cluster that you want DataSync to use for the data transfer.

   If your HDFS location is a source, DataSync copies the files in this folder to the destination. If your location is a destination, DataSync writes files to this folder.

6. Run the `create-location-hdfs` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "arn:aws:datasync:us-east-1:123456789012:location/loc-01234567890example"
}
```

Configuring DataSync transfers with an object storage system

With AWS DataSync, you can transfer data between your object storage system and one of the following AWS storage services using Basic mode tasks:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

To set up this kind of transfer, you create a location for your object storage system. You can use this location as a transfer source or destination. Transferring data to or from your on-premises object storage requires a Basic mode DataSync agent.

Prerequisites

Your object storage system must be compatible with the following Amazon S3 API operations for DataSync to connect to it:

- `AbortMultipartUpload`
- `CompleteMultipartUpload`
- `CopyObject`
- `CreateMultipartUpload`
- `DeleteObject`
- `DeleteObjects`
- `DeleteObjectTagging`
- `GetBucketLocation`
- `GetObject`
- `GetObjectTagging`
- `HeadBucket`
- `HeadObject`
- `ListObjectsV2`
- `PutObject`
- `PutObjectTagging`
- `UploadPart`

Creating your object storage transfer location

Before you begin, you need an object storage system that you plan to transfer data to or from.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Object storage**.

   You configure this location as a source or destination later.

4. For **Server**, provide the domain name or IP address of the object storage server.
5. For **Bucket name**, enter the name of the object storage bucket involved in the transfer.
6. For **Folder**, enter an object prefix.

   DataSync only copies objects with this prefix.
7. If your transfer requires an agent, choose **Use agents**, then choose the DataSync agent that connects to your object storage system.

   Some transfers don't require agents. In other scenarios, you might want to use more than one agent. For more information, see Situations when you don't need a DataSync agent and Using multiple DataSync agents.
8. To configure the connection to the object storage server, expand **Additional settings** and do the following:

   a. For **Server protocol**, choose **HTTP** or **HTTPS**.

   b. For **Server port**, use a default port (**80** for HTTP or **443** for HTTPS) or specify a custom port if needed.

   c. For **Certificate**, if your object storage system uses a private or self-signed certificate authority (CA), select **Choose file** and specify a single `.pem` file with a full certificate chain.

      The certificate chain might include:

      - The object storage system's certificate
      - All intermediate certificates (if there are any)
      - The root certificate of the signing CA

      You can concatenate your certificates into a `.pem` file (which can be up to 32768 bytes before base64 encoding). The following example `cat` command creates an *`object_storage_certificates`*`.pem` file that includes three certificates:

      ```
      cat object_server_certificate.pem intermediate_certificate.pem ca_root_certificate.pem
       > object_storage_certificates.pem
      ```
9. If the object storage server requires credentials for access, select **Requires credentials** and enter the **Access key** you use to access the bucket. Then either enter the **Secret key** directly, or specify an AWS Secrets Manager secret that contains the key. For more information, see Providing credentials for storage locations.

The access key and secret key can be a user name and password, respectively.

10. (Optional) Choose **Add tag** to tag your object storage location.

    Tags are key-value pairs that help you manage, filter, and search for your locations. We recommend creating at least a name tag for your location.

11. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-object-storage` command:

```
aws datasync create-location-object-storage \
    --server-hostname object-storage-server.example.com \
    --bucket-name your-bucket \
    --agent-arns arn:aws:datasync:us-east-1:123456789012:agent/
agent-01234567890deadfb
```

2. Specify the following required parameters in the command:

   - `--server-hostname` – Specify the domain name or IP address of your object storage server.
   - `--bucket-name` – Specify the name of the bucket on your object storage server that you're transferring to or from.

3. (Optional) Add any of the following parameters to the command:

   - `--agent-arns` – Specify the DataSync agents that you want to connect to your object storage server.
   - `--server-port` – Specifies the port that your object storage server accepts inbound network traffic on (for example, port 443).
   - `--server-protocol` – Specifies the protocol (HTTP or HTTPS) which your object storage server uses to communicate.
   - `--access-key` – Specifies the access key (for example, a user name) if credentials are required to authenticate with the object storage server.
   - `--secret-key` – Specifies the secret key (for example, a password) if credentials are required to authenticate with the object storage server.

You can also provide additional parameters for securing your keys using AWS Secrets Manager. For more information, see Providing credentials for storage locations.

- `--server-certificate` – Specifies a certificate chain for DataSync to authenticate with your object storage system if the system uses a private or self-signed certificate authority (CA). You must specify a single `.pem` file with a full certificate chain (for example, `file:///home/user/.ssh/object_storage_certificates.pem`).

  The certificate chain might include:

  - The object storage system's certificate
  - All intermediate certificates (if there are any)
  - The root certificate of the signing CA

  You can concatenate your certificates into a `.pem` file (which can be up to 32768 bytes before base64 encoding). The following example `cat` command creates an *`object_storage_certificates`*`.pem` file that includes three certificates:

  ```
  cat object_server_certificate.pem intermediate_certificate.pem ca_root_certificate.pem
   > object_storage_certificates.pem
  ```

- `--subdirectory` – Specifies the object prefix for your object storage server.

  DataSync only copies objects with this prefix.

- `--tags` – Specifies the key-value pair that represents a tag that you want to add to the location resource.

  Tags can help you manage, filter, and search for your resources. We recommend creating a name tag for your location.

4. Run the `create-location-object-storage` command.

   You get a response that shows you the location ARN that you just created.

   ```
   {
       "LocationArn": "arn:aws:datasync:us-east-1:123456789012:location/
   loc-01234567890abcdef"
   }
   ```

Transferring to or from AWS storage with AWS DataSync

With AWS DataSync, you can transfer data to or from a number of AWS storage services. For more information, see Where can I transfer my data with DataSync?

Topics

Configuring AWS DataSync transfers with Amazon S3

To transfer data to or from your Amazon S3 bucket, you create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to S3 buckets

DataSync needs access to the S3 bucket that you're transferring to or from. To do this, you must create an AWS Identity and Access Management (IAM) role that DataSync assumes with the permissions required to access the bucket. You then specify this role when creating your Amazon S3 location for DataSync.

Contents

Required permissions

The permissions that your IAM role needs can depend on whether bucket is a DataSync source or destination location. Amazon S3 on Outposts requires a different set of permissions.

Amazon S3 (source location)

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "s3:GetBucketLocation",
                "s3:ListBucket",
                "s3:ListBucketMultipartUploads"
            ],
            "Effect": "Allow",
            "Resource": "arn:aws:s3:::amzn-s3-demo-bucket"
        },
        {
            "Action": [
                "s3:GetObject",
                "s3:GetObjectTagging",
                "s3:GetObjectVersion",
                "s3:GetObjectVersionTagging",
                "s3:ListMultipartUploadParts"
              ],
            "Effect": "Allow",
            "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*"
        }
    ]
}
```

Amazon S3 (destination location)

```
{
 "Version": "2012-10-17",
 "Statement": [
     {
         "Action": [
             "s3:GetBucketLocation",
             "s3:ListBucket",
             "s3:ListBucketMultipartUploads"
         ],
         "Effect": "Allow",
         "Resource": "arn:aws:s3:::amzn-s3-demo-bucket",
         "Condition": {
             "StringEquals": {
```

```
                "aws:ResourceAccount": "123456789012"
            }
        }
    },
    {
        "Action": [
            "s3:AbortMultipartUpload",
            "s3:DeleteObject",
            "s3:GetObject",
            "s3:GetObjectTagging",
            "s3:GetObjectVersion",
            "s3:GetObjectVersionTagging",
            "s3:ListMultipartUploadParts",
            "s3:PutObject",
            "s3:PutObjectTagging"
          ],
        "Effect": "Allow",
        "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*",
        "Condition": {
            "StringEquals": {
                "aws:ResourceAccount": "123456789012"
            }
        }
    }
 ]
}
```

Creating an IAM role for DataSync to access your Amazon S3 location

When creating your Amazon S3 location in the console, DataSync can automatically create and assume an IAM role that normally has the right permissions to access your S3 bucket.

In some situations, you might need to create this role manually (for example, accessing buckets with extra layers of security or transferring to or from a bucket in a different AWS accounts).

Manually creating an IAM role for DataSync

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
3. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.

4. For **Use case**, choose **DataSync** in the dropdown list and select **DataSync**. Choose **Next**.
5. On the **Add permissions** page, choose **Next**. Give your role a name and choose **Create role**.
6. On the **Roles** page, search for the role that you just created and choose its name.
7. On the role's details page, choose the **Permissions** tab. Choose **Add permissions** then **Create inline policy**.
8. Choose the **JSON** tab and add the permissions required to access your bucket into the policy editor.
9. Choose **Next**. Give your policy a name and choose **Create policy**.
10. (Recommended) To prevent the cross-service confused deputy problem, do the following:

    a. On the role's details page, choose the **Trust relationships** tab. Choose **Edit trust policy**.

    b. Choose **Update policy**.

You can specify this role when creating your Amazon S3 location.

Accessing S3 buckets using server-side encryption

DataSync can transfer data to or from S3 buckets that use server-side encryption. The type of encryption key a bucket uses can determine if you need a custom policy allowing DataSync to access the bucket.

When using DataSync with S3 buckets that use server-side encryption, remember the following:

- **If your S3 bucket is encrypted with an AWS managed key** – DataSync can access the bucket's objects by default if all your resources are in the same AWS account.
- **If your S3 bucket is encrypted with a customer managed AWS Key Management Service (AWS KMS) key (SSE-KMS)** – The key's policy must include the IAM role that DataSync uses to access the bucket.
- **If your S3 bucket is encrypted with a customer managed SSE-KMS key and in a different AWS account** – DataSync needs permission to access the bucket in the other AWS account. You can set up this up by doing the following:
  - In the IAM role that DataSync uses, you must specify the cross-account bucket's SSE-KMS key by using the key's fully qualified Amazon Resource Name (ARN). This is the same key ARN that you use to configure the bucket's default encryption. You can't specify a key ID, alias name, or alias ARN in this situation.

    Here's an example key ARN:

`arn:aws:kms:us-west-2:111122223333:key/1234abcd-12ab-34cd-56ef-1234567890ab`

For more information on specifying KMS keys in IAM policy statements, see the *AWS Key Management Service Developer Guide*.

- In the SSE-KMS key policy, specify the IAM role used by DataSync.

- **If your S3 bucket is encrypted with a customer managed AWS KMS key (DSSE-KMS) for dual-layer server-side encryption** – The key's policy must include the IAM role that DataSync uses to access the bucket. (Keep in mind that DSSE-KMS doesn't support S3 Bucket Keys, which can reduce AWS KMS request costs.)
- **If your S3 bucket is encrypted with a customer-provided encryption key (SSE-C)** – DataSync can't access this bucket.

Example: SSE-KMS key policy for DataSync

The following example is a key policy for a customer-managed SSE-KMS key. The policy is associated with an S3 bucket that uses server-side encryption.

If you want to use this example, replace the following values with your own:

- *account-id* – Your AWS account.
- *admin-role-name* – The name of the IAM role that can administer the key.
- *datasync-role-name* – The name of the IAM role that allows DataSync to use the key when accessing the bucket.

```
{
    "Id": "key-consolepolicy-3",
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Enable IAM Permissions",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::111122223333:root"
            },
            "Action": "kms:*",
            "Resource": "*"
```

```
        },
        {
            "Sid": "Allow access for Key Administrators",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::111122223333:role/admin-role-name"
            },
            "Action": [
                "kms:Create*",
                "kms:Describe*",
                "kms:Enable*",
                "kms:List*",
                "kms:Put*",
                "kms:Update*",
                "kms:Revoke*",
                "kms:Disable*",
                "kms:Get*",
                "kms:Delete*",
                "kms:TagResource",
                "kms:UntagResource",
                "kms:ScheduleKeyDeletion",
                "kms:CancelKeyDeletion"
            ],
            "Resource": "*"
        },
        {
            "Sid": "Allow use of the key",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::111122223333:role/datasync-role-name"
            },
            "Action": [
                "kms:Encrypt",
                "kms:Decrypt",
                "kms:ReEncrypt*",
                "kms:GenerateDataKey*"
            ],
            "Resource": "*"
        }
    ]
}
```

Accessing restricted S3 buckets

If you need to transfer to or from an S3 bucket that typically denies all access, you can edit the bucket policy so that DataSync can access the bucket only for your transfer.

Example: Allowing access based on IAM roles

1. Copy the following S3 bucket policy.

```
{
    "Version": "2012-10-17",
    "Statement": [{
        "Sid": "Deny-access-to-bucket",
        "Effect": "Deny",
        "Principal": "*",
        "Action": "s3:*",
        "Resource": [
            "arn:aws:s3:::amzn-s3-demo-bucket",
            "arn:aws:s3:::amzn-s3-demo-bucket/*"
        ],
        "Condition": {
            "StringNotLike": {
                "aws:userid": [
                    "datasync-iam-role-id:*",
                    "your-iam-role-id"
                ]
            }
        }
    }]
}
```

2. In the policy, replace the following values:

   - *amzn-s3-demo-bucket* – Specify the name of the restricted S3 bucket.
   - *datasync-iam-role-id* – Specify the ID of the IAM role that DataSync uses to access the bucket.

     Run the following AWS CLI command to get the IAM role ID:

     ```
     aws iam get-role --role-name datasync-iam-role-name
     ```

     In the output, look for the `RoleId` value:

```
"RoleId": "ANPAJ2UCCR6DPCEXAMPLE"
```

- *your-iam-role-id* – Specify the ID of the IAM role that you use to create your DataSync location for the bucket.

  Run the following command to get the IAM role ID:

  ```
  aws iam get-role --role-name your-iam-role-name
  ```

  In the output, look for the `RoleId` value:

  ```
  "RoleId": "AIDACKCEVSQ6C2EXAMPLE"
  ```

3. Add this policy to your S3 bucket policy.
4. When you're done using DataSync with the restricted bucket, remove the conditions for both IAM roles from the bucket policy.

Accessing S3 buckets with restricted VPC access

An Amazon S3 bucket that limits access to specific virtual private cloud (VPC) endpoints or VPCs will deny DataSync from transferring to or from that bucket. To enable transfers in these situations, you can update the bucket's policy to include the IAM role that you specify with your DataSync location.

Option 1: Allowing access based on DataSync location role ARN

In the S3 bucket policy, you can specify the Amazon Resource Name (ARN) of your DataSync location IAM role.

The following example is an S3 bucket policy that denies access from all but two VPCs (`vpc-1234567890abcdef0` and `vpc-abcdef01234567890`). However, the policy also includes the ArnNotLikeIfExists condition and aws:PrincipalArn condition key, which allow the ARN of a DataSync location role to access the bucket.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Access-to-specific-VPCs-only",
            "Effect": "Deny",
            "Principal": "*",
```

```
            "Action": "s3:*",
            "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*",
            "Condition": {
                "StringNotEqualsIfExists": {
                    "aws:SourceVpc": [
                        "vpc-1234567890abcdef0",
                        "vpc-abcdef01234567890"
                    ]
                },
                "ArnNotLikeIfExists": {
                    "aws:PrincipalArn": [
                        "arn:aws:iam::111122223333:role/datasync-location-role-name"
                    ]
                }
            }
        }
    ]
}
```

Option 2: Allowing access based on DataSync location role tag

In the S3 bucket policy, you can specify a tag attached to your DataSync location IAM role.

The following example is an S3 bucket policy that denies access from all but two VPCs (`vpc-1234567890abcdef0` and `vpc-abcdef01234567890`). However, the policy also includes the StringNotEqualsIfExists condition and aws:PrincipalTag condition key, which allow a principal with the tag key `exclude-from-vpc-restriction` and value `true`. You can try a similar approach in your bucket policy by specifying a tag attached to your DataSync location role.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Access-to-specific-VPCs-only",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:*",
            "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*",
            "Condition": {
                "StringNotEqualsIfExists": {
                    "aws:SourceVpc": [
                        "vpc-1234567890abcdef0",
```

```
                    "vpc-abcdef01234567890"
                ],
                "aws:PrincipalTag/exclude-from-vpc-restriction": "true"
            }
        }
    }
  ]
}
```

Storage class considerations with Amazon S3 transfers

When Amazon S3 is your destination location, DataSync can transfer your data directly into a specific Amazon S3 storage class.

Some storage classes have behaviors that can affect your Amazon S3 storage costs. When using storage classes that can incur additional charges for overwriting, deleting, or retrieving objects, changes to object data or metadata result in such charges. For more information, see Amazon S3 pricing.

> **Important**
>
> New objects transferred to your Amazon S3 destination location are stored using the storage class that you specify when creating your location.
> By default, DataSync preserves the storage class of existing objects in your destination location unless you configure your task to transfer all data. In those situations, the storage class that you specify when creating your location is used for all objects.

Amazon S3 storage class	Considerations
S3 Standard	Choose S3 Standard to store your frequently accessed files redundant ly in multiple Availability Zones that are geographically separated. This is the default if you don't specify a storage class.
S3 Intelligent-Tiering	Choose S3 Intelligent-Tiering to optimize storage costs by automatic ally moving data to the most cost-effective storage access tier.

Amazon S3 storage class	Considerations
	You pay a monthly charge per object stored in the S3 Intelligent-Tiering storage class. This Amazon S3 charge includes monitoring data access patterns and moving objects between tiers.
S3 Standard-IA	Choose S3 Standard-IA to store your infrequently accessed objects redundantly in multiple Availability Zones that are geographically separated. Objects stored in the S3 Standard-IA storage class can incur additiona l charges for overwriting, deleting, or retrieving. Consider how often these objects change, how long you plan to keep these objects, and how often you need to access them. Changes to object data or metadata are equivalent to deleting an object and creating a new one to replace it. This results in additional charges for objects stored in the S3 Standard-IA storage class. Objects less than 128 KB are smaller than the minimum capacity charge per object in the S3 Standard-IA storage class. These objects are stored in the S3 Standard storage class.
S3 One Zone-IA	Choose S3 One Zone-IA to store your infrequently accessed objects in a single Availability Zone. Objects stored in the S3 One Zone-IA storage class can incur additiona l charges for overwriting, deleting, or retrieving. Consider how often these objects change, how long you plan to keep these objects, and how often you need to access them. Changes to object data or metadata are equivalent to deleting an object and creating a new one to replace it. This results in additional charges for objects stored in the S3 One Zone-IA storage class. Objects less than 128 KB are smaller than the minimum capacity charge per object in the S3 One Zone-IA storage class. These objects are stored in the S3 Standard storage class.

Amazon S3 storage class	Considerations
S3 Glacier Instant Retrieval	Choose S3 Glacier Instant Retrieval to archive objects that are rarely accessed but require retrieval in milliseconds. Data stored in the S3 Glacier Instant Retrieval storage class offers cost savings compared to the S3 Standard-IA storage class with the same latency and throughput performance. S3 Glacier Instant Retrieval has higher data access costs than S3 Standard-IA, though. Objects stored in S3 Glacier Instant Retrieval can incur additional charges for overwriting, deleting, or retrieving. Consider how often these objects change, how long you plan to keep these objects, and how often you need to access them. Changes to object data or metadata are equivalent to deleting an object and creating a new one to replace it. This results in additional charges for objects stored in the S3 Glacier Instant Retrieval storage class. Objects less than 128 KB are smaller than the minimum capacity charge per object in the S3 Glacier Instant Retrieval storage class. These objects are stored in the S3 Standard storage class.

Amazon S3 storage class	Considerations
S3 Glacier Flexible Retrieval	Choose S3 Glacier Flexible Retrieval for more active archives. Objects stored in S3 Glacier Flexible Retrieval can incur additional charges for overwriting, deleting, or retrieving. Consider how often these objects change, how long you plan to keep these objects, and how often you need to access them. Changes to object data or metadata are equivalent to deleting an object and creating a new one to replace it. This results in additional charges for objects stored in the S3 Glacier Flexible Retrieval storage class. The S3 Glacier Flexible Retrieval storage class requires 40 KB of additional metadata for each archived object. DataSync puts objects that are less than 40 KB in the S3 Standard storage class. You must restore objects archived in this storage class before DataSync can read them. For information, see Working with archived objects in the *Amazon S3 User Guide*. When using S3 Glacier Flexible Retrieval, choose the **Verify only the data transferred** task option to compare data and metadata checksums at the end of the transfer. You can't use the **Verify all data in the destination** option for this storage class because it requires retrieving all existing objects from the destination.

Amazon S3 storage class	Considerations
S3 Glacier Deep Archive	Choose S3 Glacier Deep Archive to archive your objects for long-term data retention and digital preservation where data is accessed once or twice a year. Objects stored in S3 Glacier Deep Archive can incur additional charges for overwriting, deleting, or retrieving. Consider how often these objects change, how long you plan to keep these objects, and how often you need to access them. Changes to object data or metadata are equivalent to deleting an object and creating a new one to replace it. This results in additional charges for objects stored in the S3 Glacier Deep Archive storage class. The S3 Glacier Deep Archive storage class requires 40 KB of additional metadata for each archived object. DataSync puts objects that are less than 40 KB in the S3 Standard storage class. You must restore objects archived in this storage class before DataSync can read them. For information, see Working with archived objects in the *Amazon S3 User Guide*. When using S3 Glacier Deep Archive, choose the **Verify only the data transferred** task option to compare data and metadata checksums at the end of the transfer. You can't use the **Verify all data in the destination** option for this storage class because it requires retrieving all existing objects from the destination.
S3 Outposts	The storage class for Amazon S3 on Outposts.

Evaluating S3 request costs when using DataSync

With Amazon S3 locations, you incur costs related to S3 API requests made by DataSync. This section can help you understand how DataSync uses these requests and how they might affect your Amazon S3 costs.

Topics

- S3 requests made by DataSync
- Cost considerations

S3 requests made by DataSync

The following table describes the S3 requests that DataSync can make when you're copying data to or from an Amazon S3 location.

S3 request	How DataSync uses it
ListObjectV2	DataSync makes at least one `LIST` request for every object ending in a forward slash (/) to list the objects that start with that prefix. This request is called during a task's preparing phase.
HeadObject	DataSync makes `HEAD` requests to retrieve object metadata during a task's preparing and verifying phases. There can be multiple `HEAD` requests per object depending on how you want DataSync to verify the integrity of the data it transfers.
GetObject	DataSync makes `GET` requests to read data from an object during a task's transferring phase. There can be multiple `GET` requests for large objects.
GetObjectTagging	If you configure your task to copy object tags, DataSync makes these `GET` requests to check for object tags during the task's preparing and transferring phases.
PutObject	DataSync makes `PUT` requests to create objects and prefixes in a destination S3 bucket during a task's transferring phase. Since DataSync uses the Amazon S3 multipart upload feature, there can be multiple `PUT`

S3 request	How DataSync uses it
	requests for large objects. To help minimize storage costs, we recommend using a lifecycle configuration to stop incomplete multipart uploads.
PutObjectTagging	If your source objects have tags and you configure your task to copy object tags, DataSync makes these PUT requests when transferring those tags.
CopyObject	DataSync makes a COPY request to create a copy of an object only if that object's metadata changes. This can happen if you originally copied data to the S3 bucket using another service or tool that didn't carry over its metadata.

Cost considerations

DataSync makes S3 requests on S3 buckets every time you run your task. This can lead to charges adding up in certain situations. For example:

- You're frequently transferring objects to or from an S3 bucket.
- You may not be transferring much data, but your S3 bucket has lots of objects in it. You can still see high charges in this scenario because DataSync makes S3 requests on each of the bucket's objects.
- You're transferring between S3 buckets, so DataSync is making S3 requests on the source and destination.

To help minimize S3 request costs related to DataSync, consider the following:

Topics

- What S3 storage classes am I using?
- How often do I need to transfer my data?

What S3 storage classes am I using?

S3 request charges can vary based on the Amazon S3 storage class your objects are using, particularly for classes that archive objects (such as S3 Glacier Instant Retrieval, S3 Glacier Flexible Retrieval, and S3 Glacier Deep Archive).

Here are some scenarios in which storage classes can affect your S3 request charges when using DataSync:

- Each time you run a task, DataSync makes HEAD requests to retrieve object metadata. These requests result in charges even if you aren't moving any objects. How much these requests affect your bill depends on the storage class your objects are using along with the number of objects that DataSync scans.
- If you moved objects into the S3 Glacier Instant Retrieval storage class (either directly or through a bucket lifecycle configuration), requests on objects in this class are more expensive than objects in other storage classes.
- If you configure your DataSync task to verify that your source and destination locations are fully synchronized, there will be GET requests for each object in all storage classes (except S3 Glacier Flexible Retrieval and S3 Glacier Deep Archive).
- In addition to GET requests, you incur data retrieval costs for objects in the S3 Standard-IA, S3 One Zone-IA, or S3 Glacier Instant Retrieval storage class.

For more information, see Amazon S3 pricing.

How often do I need to transfer my data?

If you need to move data on a recurring basis, think about a schedule that doesn't run more tasks than you need.

You may also consider limiting the scope of your transfers. For example, you can configure DataSync to focus on objects in certain prefixes or filter what data gets transferred. These options can help reduce the number of S3 requests made each time you run your DataSync task.

Object considerations with Amazon S3 transfers

- If you're transferring from an S3 bucket, use S3 Storage Lens to determine how many objects you're moving.
- When transferring between S3 buckets, we recommend using Enhanced task mode because you aren't subject to DataSync task quotas.

- DataSync might not transfer an object with nonstandard characters in its name. For more information, see the object key naming guidelines in the *Amazon S3 User Guide*.
- When using DataSync with an S3 bucket that uses versioning, remember the following:
  - When transferring to an S3 bucket, DataSync creates a new version of an object if that object is modified at the source. This results in additional charges.
  - An object has different version IDs in the source and destination buckets.
  - Only the most recent version of each object is transferred from the source bucket. Earlier versions are not copied to the destination.
- After initially transferring data from an S3 bucket to a file system (for example, NFS or Amazon FSx), subsequent runs of the same DataSync task won't include objects that have been modified but are the same size they were during the first transfer.

Creating your transfer location for an Amazon S3 general purpose bucket

To create a location for your transfer, you need an existing S3 general purpose bucket. If you don't have one, see the *Amazon S3 User Guide*.

> **Important**
>
> Before you create your location, make sure that you read the following sections:
>
> - Storage class considerations with Amazon S3 transfers
> - Evaluating S3 request costs when using DataSync

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon S3**, and then choose **General purpose bucket**.
4. For **S3 URI**, enter or choose the bucket and prefix that you want to use for your location.

   > **Warning**
   >
   > DataSync can't transfer objects with a prefix that begins with a slash (/) or includes //, /./, or /../ patterns. For example:

- `/photos`
- `photos//2006/January`
- `photos/./2006/February`
- `photos/../2006/March`

5. For **S3 storage class when used as a destination**, choose a storage class that you want your objects to use when Amazon S3 is a transfer destination.

   For more information, see Storage class considerations with Amazon S3 transfers.

6. For **IAM role**, do one of the following:

   - Choose **Autogenerate** for DataSync to automatically create an IAM role with the permissions required to access the S3 bucket.

     If DataSync previously created an IAM role for this S3 bucket, that role is chosen by default.
   - Choose a custom IAM role that you created. For more information, see Creating an IAM role for DataSync to access your Amazon S3 location.

7. (Optional) Choose **Add new tag** to tag your Amazon S3 location.

   Tags can help you manage, filter, and search for your resources. We recommend creating a name tag for your location.

8. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-s3` command:

```
aws datasync create-location-s3 \
    --s3-bucket-arn 'arn:aws:s3:::amzn-s3-demo-bucket' \
    --s3-storage-class 'your-S3-storage-class' \
    --s3-config 'BucketAccessRoleArn=arn:aws:iam::account-id:role/role-allowing-datasync-operations' \
    --subdirectory /your-prefix-name
```

2. For `--s3-bucket-arn`, specify the ARN of the S3 bucket that you want to use as a location.
3. For `--s3-storage-class`, specify a storage class that you want your objects to use when Amazon S3 is a transfer destination.

4. For `--s3-config`, specify the ARN of the IAM role that DataSync needs to access your bucket.

   For more information, see Creating an IAM role for DataSync to access your Amazon S3 location.

5. For `--subdirectory`, specify a prefix in the S3 bucket that DataSync reads from or writes to (depending on whether the bucket is a source or destination location).

   > **Warning**
   >
   > DataSync can't transfer objects with a prefix that begins with a slash (/) or includes `//`, `/./`, or `/../` patterns. For example:
   >
   > - `/photos`
   > - `photos//2006/January`
   > - `photos/./2006/February`
   > - `photos/../2006/March`

6. Run the `create-location-s3` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:111222333444:location/
loc-0b3017fc4ba4a2d8d"
}
```

You can use this location as a source or destination for your DataSync task.

Creating your transfer location for an S3 on Outposts bucket

To create a location for your transfer, you need an existing Amazon S3 on Outposts bucket. If you don't have one, see the *Amazon S3 on Outposts User Guide*.

You also need a DataSync agent. For more information, see Deploying your Basic mode agent on AWS Outposts.

When transferring from an S3 on Outposts bucket prefix that contains a large dataset (such as hundreds of thousands or millions of objects), your DataSync task might time out. To avoid this,

consider using a DataSync manifest, which lets you specify the exact objects that you need to transfer.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon S3**, and then choose **Outposts bucket**.
4. For **S3 bucket**, choose an Amazon S3 access point that can access your S3 on Outposts bucket.

   For more information, see the *Amazon S3 User Guide*.
5. For **S3 storage class when used as a destination**, choose a storage class that you want your objects to use when Amazon S3 is a transfer destination.

   For more information, see Storage class considerations with Amazon S3 transfers. DataSync by default uses the S3 Outposts storage class for Amazon S3 on Outposts.
6. For **Agents**, specify the Amazon Resource Name (ARN) of the DataSync agent on your Outpost.
7. For **Folder**, enter a prefix in the S3 bucket that DataSync reads from or writes to (depending on whether the bucket is a source or destination location).

   > **Warning**
   >
   > DataSync can't transfer objects with a prefix that begins with a slash (/) or includes `//`, `/./`, or `/../` patterns. For example:
   >
   > - `/photos`
   > - `photos//2006/January`
   > - `photos/./2006/February`
   > - `photos/../2006/March`
8. For **IAM role**, do one of the following:

   - Choose **Autogenerate** for DataSync to automatically create an IAM role with the permissions required to access the S3 bucket.

     If DataSync previously created an IAM role for this S3 bucket, that role is chosen by default.

- Choose a custom IAM role that you created. For more information, see Creating an IAM role for DataSync to access your Amazon S3 location.

9. (Optional) Choose **Add new tag** to tag your Amazon S3 location.

   Tags can help you manage, filter, and search for your resources. We recommend creating a name tag for your location.

10. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-s3` command:

```
aws datasync create-location-s3 \
    --s3-bucket-arn 'bucket-access-point' \
    --s3-storage-class 'your-S3-storage-class' \
    --s3-config 'BucketAccessRoleArn=arn:aws:iam::account-id:role/role-allowing-datasync-operations' \
    --subdirectory /your-folder \
    --agent-arns 'arn:aws:datasync:your-region:account-id:agent/agent-agent-id'
```

2. For `--s3-bucket-arn`, specify the ARN an Amazon S3 access point that can access your S3 on Outposts bucket.

   For more information, see the *Amazon S3 User Guide*.

3. For `--s3-storage-class`, specify a storage class that you want your objects to use when Amazon S3 is a transfer destination.

   For more information, see Storage class considerations with Amazon S3 transfers. DataSync by default uses the S3 Outposts storage class for S3 on Outposts.

4. For `--s3-config`, specify the ARN of the IAM role that DataSync needs to access your bucket.

   For more information, see Creating an IAM role for DataSync to access your Amazon S3 location.

5. For `--subdirectory`, specify a prefix in the S3 bucket that DataSync reads from or writes to (depending on whether the bucket is a source or destination location).

> **Warning**
>
> DataSync can't transfer objects with a prefix that begins with a slash (/) or includes //, /./, or /../ patterns. For example:
>
> - /photos
> - photos//2006/January
> - photos/./2006/February
> - photos/../2006/March

6. For `--agent-arns`, specify the ARN of the DataSync agent on your Outpost.
7. Run the `create-location-s3` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:111222333444:location/
loc-0b3017fc4ba4a2d8d"
}
```

You can use this location as a source or destination for your DataSync task.

Amazon S3 transfers across AWS accounts

With DataSync, you can move data to or from S3 buckets in different AWS accounts. For more information, see the following tutorials:

- Transferring data from on-premises storage to Amazon S3 across AWS accounts
- Transferring data from Amazon S3 to Amazon S3 across AWS accounts

Amazon S3 transfers between commercial and AWS GovCloud (US) Regions

By default, DataSync doesn't transfer between S3 buckets in commercial and AWS GovCloud (US) Regions. You can still set up this kind of transfer, though, by creating an object storage location for one of the S3 buckets in your transfer. You can perform this type of transfer with or without

an agent. If you use an agent, your task must be configured for **Basic** mode. To transfer without an agent, you must use **Enhanced** mode.

Before you begin: Make sure that you understand the cost implications of transferring between Regions. For more information, see AWS DataSync Pricing.

Contents

Providing DataSync access to your object storage location's bucket

When creating the object storage location for this transfer, you must provide DataSync the credentials of an IAM user with permission to access the location's S3 bucket. For more information, see Required permissions.

> **Warning**
>
> IAM users have long-term credentials, which presents a security risk. To help mitigate this risk, we recommend that you provide these users with only the permissions they require to perform the task and that you remove these users when they are no longer needed.

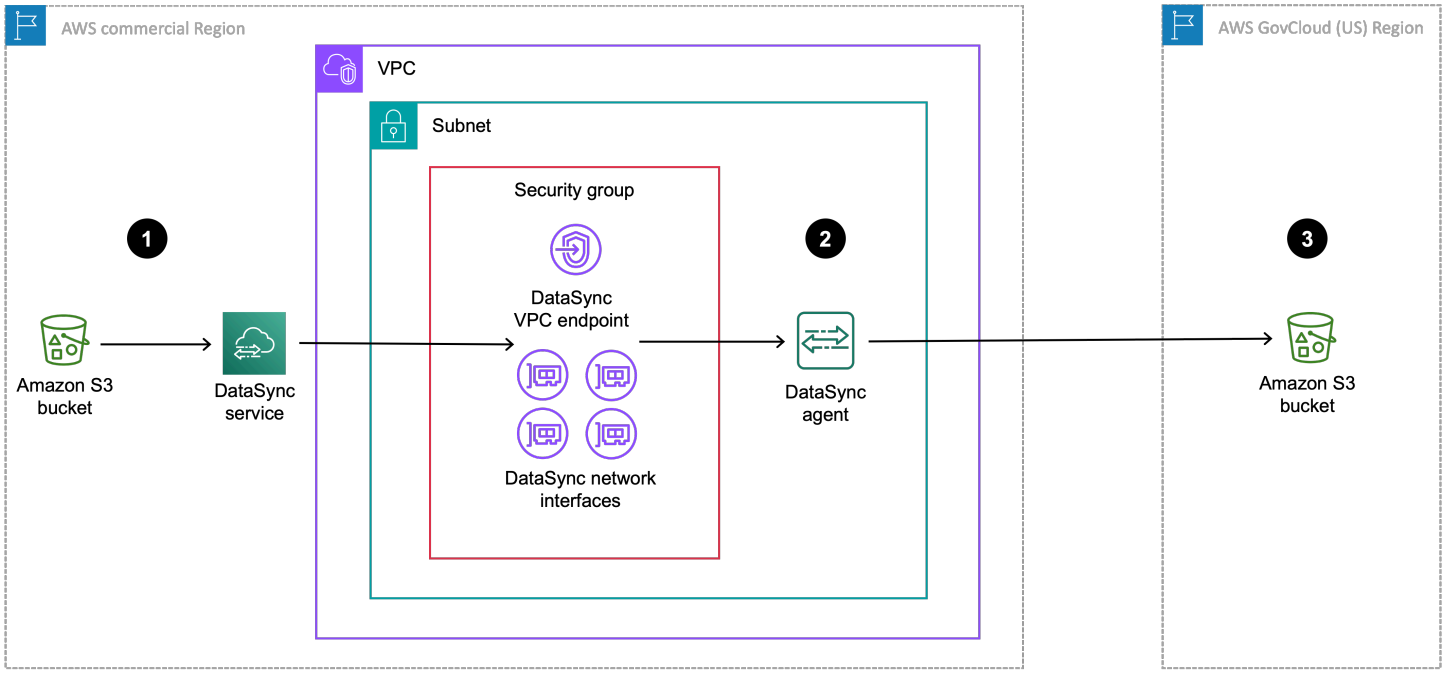
Creating your DataSync agent (optional)

If you want to run your transfer using **Basic** mode, then you will need to use an agent. Because you're transferring between a commercial and AWS GovCloud (US) Region, you deploy your DataSync agent as an Amazon EC2 instance in one of the Regions. We recommend that your agent use a VPC service endpoint to avoid data transfer charges out to the public internet. For more information, see Amazon EC2 Data Transfer pricing.

Choose one of the following scenarios that describe how to create an agent based on the Region where you plan to run your DataSync task.

When running a DataSync task in a commercial Region

The following diagram shows a transfer where your DataSync task and agent are in the commercial Region.



Reference	Description
1	In the commercial Region where you're running a DataSync task, data transfers from the source S3 bucket. The source bucket is configured as an Amazon S3 location in the commercial Region.
2	Data transfers through the DataSync agent, which is in the same VPC and subnet where the VPC service endpoint and network interfaces are located.
3	Data transfers to the destination S3 bucket in the AWS GovCloud (US) Region. The destination bucket is configured as an object storage location in the commercial Region.

You can use this same setup to transfer the opposite direction, too, from the AWS GovCloud (US) Region to the commercial Region.

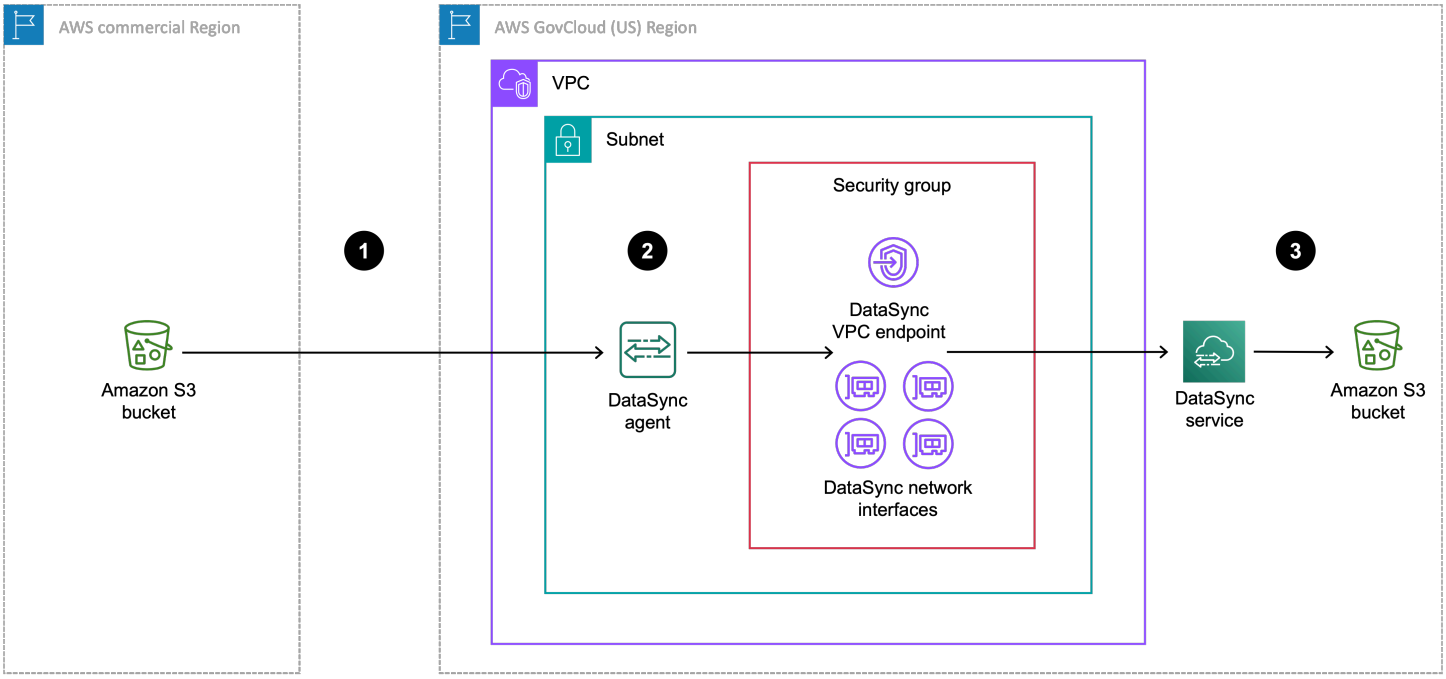
To create your DataSync agent

1. Deploy an Amazon EC2 agent in your commercial Region.
2. Configure your agent to use a VPC service endpoint.

3. Activate your agent.

When running a DataSync task in a GovCloud (US) Region

The following diagram shows a transfer where your DataSync task and agent are in the AWS GovCloud (US) Region.



Reference	Description
1	Data transfers from the source S3 bucket in the commercial Region to the AWS GovCloud (US) Region where you're running a DataSync task. The source bucket is configured as an object storage location in the AWS GovCloud (US) Region.
2	In the AWS GovCloud (US) Region, data transfers through the DataSync agent in the same VPC and subnet where the VPC service endpoint and network interfaces are located.
3	Data transfers to the destination S3 bucket in the AWS GovCloud (US) Region. The destination bucket is configured as an Amazon S3 location in the AWS GovCloud (US) Region.

You can use this same setup to transfer the opposite direction, too, from the AWS GovCloud (US) Region to the commercial Region.

To create your DataSync agent

1. Deploy an Amazon EC2 agent in your AWS GovCloud (US) Region.
2. Configure your agent to use a VPC service endpoint.
3. Activate your agent.

If your dataset is highly compressible, you might see reduced costs by instead creating your agent in a commercial Region while running a task in an AWS GovCloud (US) Region. There's more setup than normal for creating this agent, including preparing the agent for use in a commercial Region. For information about creating an agent for this setup, see the Move data in and out of AWS GovCloud (US) with AWS DataSync blog.

Creating an object storage location for your S3 bucket

You need an object storage location for the S3 bucket that's in the Region where you aren't running your DataSync task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. Make sure that you're in the same Region where you plan to run your task.
3. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
4. For **Location type**, choose **Object storage**.
5. For **Agents**, choose the DataSync agent that you created for this transfer.
6. For **Server**, enter an Amazon S3 endpoint for your bucket by using one of the following formats:

   - **Commercial Region bucket:** `s3.your-region.amazonaws.com`
   - **AWS GovCloud (US) Region bucket**: `s3.your-gov-region.amazonaws.com`

   For a list of Amazon S3 endpoints, see the *AWS General Reference*.
7. For **Bucket** name, enter the name of the S3 bucket.
8. For **Folder**, enter a prefix in the S3 bucket that DataSync reads from or writes to (depending on whether the bucket is a source or destination location).

> **Warning**
>
> DataSync can't transfer objects with a prefix that begins with a slash (/) or includes //, /./, or /../ patterns. For example:
>
> - /photos
> - photos//2006/January
> - photos/./2006/February
> - photos/../2006/March

9. Select **Requires credentials** and do the following:
   - For **Access key**, enter the access key for an IAM user that can access the bucket.
   - For **Secret key**, enter the same IAM user's secret key.
10. (Optional) Choose **Add tag** to tag your location.

    Tags can help you manage, filter, and search for your resources. We recommend creating a name tag for your location.
11. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-object-storage` command:

```
aws datasync create-location-object-storage \
    --server-hostname s3-endpoint \
    --bucket-name amzn-s3-demo-bucket \
    --agent-arns arn:aws:datasync:your-region:123456789012:agent/
agent-01234567890deadfb
```

2. For the `--server-hostname` parameter, specify an Amazon S3 endpoint for your bucket by using one of the following formats:
   - **Commercial Region bucket:** `s3.your-region.amazonaws.com`
   - **AWS GovCloud (US) Region bucket**: `s3.your-gov-region.amazonaws.com`

For the Region in the endpoint, make sure that you specify the same Region where you plan to run your task.

For a list of Amazon S3 endpoints, see the *AWS General Reference*.

3. For the `--bucket-name` parameter, specify the name of the S3 bucket.
4. For the `--agent-arns` parameter, specify the DataSync agent that you created for this transfer.
5. For the `--access-key` parameter, specify the access key for an IAM user that can access the bucket.
6. For the `--secret-key` parameter, enter the same IAM user's secret key.
7. (Optional) For the `--subdirectory` parameter, specify a prefix in the S3 bucket that DataSync reads from or writes to (depending on whether the bucket is a source or destination location).

   Warning

   DataSync can't transfer objects with a prefix that begins with a slash (/) or includes `//`, `/./`, or `/../` patterns. For example:

   - `/photos`
   - `photos//2006/January`
   - `photos/./2006/February`
   - `photos/../2006/March`

8. (Optional) For the `--tags` parameter, specify key-value pairs that represent tags for the location resource.

   Tags can help you manage, filter, and search for your resources. We recommend creating a name tag for your location.

9. Run the `create-location-object-storage` command.

   You get a response that shows you the location ARN that you just created.

```
{
```

```
    "LocationArn": "arn:aws:datasync:us-east-1:123456789012:location/
loc-01234567890abcdef"
}
```

You can use this location as a source or destination for your DataSync task. For the other S3 bucket in this transfer, create an Amazon S3 location.

Next steps

Some possible next steps include:

1. If needed, create your other location. For more information, see Where can I transfer my data with AWS DataSync?
2. Configure DataSync task settings, such as what files to transfer, how to handle metadata, among other options.
3. Set a schedule for your DataSync task.
4. Configure monitoring for your DataSync task.
5. Start your task.

Configuring AWS DataSync transfers with Amazon EFS

To transfer data to or from your Amazon EFS file system, you must create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to Amazon EFS file systems

Creating a location involves understanding how DataSync can access your storage. For Amazon EFS, DataSync mounts your file system as a root user from your virtual private cloud (VPC) using network interfaces.

Contents

Determining the subnet and security groups for your mount target

When creating your location, you specify the subnet and security groups that allow DataSync to connect to one of your Amazon EFS file system's mount targets.

The subnet that you specify must be located:

- In the same VPC as your file system.
- In the same Availability Zone as at least one mount target for your file system.

> **Note**
>
> You don't need to specify a subnet that includes a file system mount target.

The security groups that you specify must allow inbound traffic on Network File System (NFS) port 2049. For information on creating and updating security groups for your mount targets, see the *Amazon EFS User Guide*.

Specifying security groups associated with a mount target

You can specify a security group that's associated with one of your file system's mount targets. We recommend this approach from a network management standpoint.

Specifying security groups that aren't associated with a mount target

You also can specify a security group that isn't associated with one of your file system's mount targets. However, this security group must be able to communicate with a mount target's security group.

For example, here's how you might create a relationship between security group D (for DataSync) and security group M (for the mount target):

- Security group D, which you specify when creating your location, must have a rule that allows outbound connections on NFS port 2049 to security group M.
- Security group M, which you associate with the mount target, must allow inbound access on NFS port 2049 from security group D.

To find a mount target's security group

The following instructions can help you identify the security group of an Amazon EFS file system mount target that you want DataSync to use for your transfer.

1. In the AWS CLI, run the following `describe-mount-targets` command.

   ```
   aws efs describe-mount-targets \
       --region file-system-region  \
       --file-system-id file-system-id
   ```

   This command returns information about your file system's mount targets (similar to the following example output).

   ```
   {
       "MountTargets": [
           {
               "OwnerId": "111222333444",
               "MountTargetId": "fsmt-22334a10",
               "FileSystemId": "fs-123456ab",
               "SubnetId": "subnet-f12a0e34",
               "LifeCycleState": "available",
               "IpAddress": "11.222.0.123",
               "NetworkInterfaceId": "eni-1234a044"
           }
       ]
   }
   ```

2. Take note of the `MountTargetId` value that you want to use.
3. Run the following `describe-mount-target-security-groups` command using the `MountTargetId` to see the security group of your mount target.

   ```
   aws efs describe-mount-target-security-groups \
       --region file-system-region \
       --mount-target-id mount-target-id
   ```

You specify this security group when creating your location.

Accessing restricted file systems

DataSync can transfer to or from Amazon EFS file systems that restrict access through access points and IAM policies.

> **Note**
>
> If DataSync accesses a destination file system through an access point that enforces user identity, the POSIX user and group IDs for your source data aren't preserved if you configure your DataSync task to copy ownership. Instead, the transferred files and folders are set to the access point's user and group IDs. When this happens, task verification fails because DataSync detects a mismatch between metadata in the source and destination locations.

Contents

Creating a DataSync IAM role for file system access

If you have an Amazon EFS file system that restricts access through an IAM policy, you can create an IAM role that provides DataSync permission to read from or write data to the file system. You then might need to specify that role in your file system policy.

To create the DataSync IAM role

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
3. On the **Select trusted entity** page, for **Trusted entity type**, choose **Custom trust policy**.
4. Paste the following JSON into the policy editor:

```
{
    "Version": "2012-10-17",
    "Statement": [{
        "Effect": "Allow",
        "Principal": {
```

```
            "Service": "datasync.amazonaws.com"
        },
        "Action": "sts:AssumeRole"
    }]
}
```

5. Choose **Next**. On the **Add permissions** page, choose **Next**.
6. Give your role a name and choose **Create role**.

You specify this role when creating your location.

Example file system policy allowing DataSync access

The following example file system policy shows how access to an Amazon EFS file system (identified in the policy as `fs-`*`1234567890abcdef0`*) is restricted but still allows access to DataSync through an IAM role named *`MyDataSyncRole`*:

```
{
    "Version": "2012-10-17",
    "Id": "ExampleEFSFileSystemPolicy",
    "Statement": [{
        "Sid": "AccessEFSFileSystem",
        "Effect": "Allow",
        "Principal": {
            "AWS": "arn:aws:iam::111122223333:role/MyDataSyncRole"
        },
        "Action": [
            "elasticfilesystem:ClientMount",
            "elasticfilesystem:ClientWrite",
            "elasticfilesystem:ClientRootAccess"
        ],
        "Resource": "arn:aws:elasticfilesystem:us-east-1:111122223333:file-system/
fs-1234567890abcdef0",
        "Condition": {
            "Bool": {
                "aws:SecureTransport": "true"
            },
            "StringEquals": {
                "elasticfilesystem:AccessPointArn": "arn:aws:elasticfilesystem:us-
east-1:111122223333:access-point/fsap-abcdef01234567890"
            }
        }
```

```
    }]
}
```

- `Principal` – Specifies an IAM role that gives DataSync permission to access the file system.
- `Action` – Gives DataSync root access and allows it to read from and write to the file system.
- `aws:SecureTransport` – Requires NFS clients to use TLS when connecting to the file system.
- `elasticfilesystem:AccessPointArn` – Allows access to the file system only through a specific access point.

Network considerations with Amazon EFS transfers

VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.

Performance considerations with Amazon EFS transfers

Your Amazon EFS file system's throughput mode can affect transfer duration and file system performance during the transfer. Consider the following:

- For best results, we recommend using Elastic throughput mode. If you don't use Elastic throughput mode, your transfer might take longer.
- If you use Bursting throughput mode, the performance of your file system's applications might be affected because DataSync consumes file system burst credits.
- How you configure DataSync to verify your transferred data can affect file system performance and data access costs.

For more information, see Amazon EFS performance in the *Amazon Elastic File System User Guide* and the Amazon EFS Pricing page.

Creating your Amazon EFS transfer location

To create the transfer location, you need an existing Amazon EFS file system. If you don't have one, see Getting started with Amazon EFS in the *Amazon Elastic File System User Guide*.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon EFS file system**.

   You configure this location as a source or destination later.
4. For **File system**, choose the Amazon EFS file system that you want to use as a location.
5. For **Mount path**, enter a mount path for your Amazon EFS file system.

   This specifies where DataSync reads or writes data (depending on if this is a source or destination location) on your file system.

   By default, DataSync uses the root directory (or access point if you provide one for the **EFS access point** setting). You can also specify subdirectories using forward slashes (for example, `/path/to/directory`).
6. For **Subnet** choose a subnet where you want DataSync to create the network interfaces for managing your data transfer traffic.

   The subnet must be located:

   - In the same VPC as your file system.
   - In the same Availability Zone as at least one file system mount target.

   > **Note**
   >
   > You don't need to specify a subnet that includes a file system mount target.
7. For **Security groups**, choose the security group associated with your Amazon EFS file system's mount target. You can choose more than one security group.

   > **Note**
   >
   > The security groups that you specify must allow inbound traffic on NFS port 2049. For more information, see Determining the subnet and security groups for your mount target.
8. For **In-transit encryption**, choose whether you want DataSync to use Transport Layer Security (TLS) encryption when it transfers data to or from your file system.

> **Note**
>
> You must enable this setting to configure an access point, IAM role, or both with your Amazon EFS location.

9. (Optional) For **EFS access point**, choose an access point that DataSync can use to mount your file system.

   For more information, see Accessing restricted file systems.

10. (Optional) For **IAM role**, specify a role that allows DataSync to access your file system.

    For information on creating this role, see Creating a DataSync IAM role for file system access.

11. (Optional) Select **Add tag** to tag your file system.

    A *tag* is a key-value pair that helps you manage, filter, and search for your locations.

12. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-efs` command:

```
aws datasync create-location-efs \
    --efs-filesystem-arn 'arn:aws:elasticfilesystem:region:account-id:file-
system/file-system-id' \
    --subdirectory /path/to/your/subdirectory \
    --ec2-config SecurityGroupArns='arn:aws:ec2:region:account-id:security-
group/security-group-id',SubnetArn='arn:aws:ec2:region:account-id:subnet/subnet-id'
 \
    --in-transit-encryption TLS1_2 \
    --access-point-arn 'arn:aws:elasticfilesystem:region:account-id:access-
point/access-point-id' \
    --file-system-access-role-arn 'arn:aws:iam::account-id:role/datasync-efs-
access-role
```

2. For `--efs-filesystem-arn`, specify the Amazon Resource Name (ARN) of the Amazon EFS file system that you're transferring to or from.
3. For `--subdirectory`, specify a mount path for your file system.

This is where DataSync reads or writes data (depending on if this is a source or destination location) on your file system.

By default, DataSync uses the root directory (or access point if you provide one with `--access-point-arn`). You can also specify subdirectories using forward slashes (for example, `/path/to/directory`).

4. For `--ec2-config`, do the following:

   - For `SecurityGroupArns`, specify the ARN of the security group associated with your file system's mount target. You can specify more than one security group.

     > **Note**
     >
     > The security groups that you specify must allow inbound traffic on NFS port 2049. For more information, see Determining the subnet and security groups for your mount target.

   - For `SubnetArn`, specify the ARN of the subnet where you want DataSync to create the network interfaces for managing your data transfer traffic.

     The subnet must be located:

     - In the same VPC as your file system.
     - In the same Availability Zone as at least one file system mount target.

     > **Note**
     >
     > You don't need to specify a subnet that includes a file system mount target.

5. For `--in-transit-encryption`, specify whether you want DataSync to use Transport Layer Security (TLS) encryption when it transfers data to or from your file system.

   > **Note**
   >
   > You must set this to `TLS1_2` to configure an access point, IAM role, or both with your Amazon EFS location.

6. (Optional) For `--access-point-arn`, specify the ARN of an access point that DataSync can use to mount your file system.

   For more information, see Accessing restricted file systems.

7. (Optional) For `--file-system-access-role-arn`, specify the ARN of an IAM role that allows DataSync to access your file system.

   For information on creating this role, see Creating a DataSync IAM role for file system access.

8. Run the `create-location-efs` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:111222333444:location/
loc-0b3017fc4ba4a2d8d"
}
```

Configuring transfers with FSx for Windows File Server

To transfer data to or from your Amazon FSx for Windows File Server file system, you must create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to FSx for Windows File Server file systems

DataSync connects to your FSx for Windows File Server file system with the Server Message Block (SMB) protocol and mounts it from your virtual private cloud (VPC) using network interfaces.

> **Note**
>
> VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.

Topics

- Required permissions
- Required authentication protocols

- DFS Namespaces

Required permissions

You must provide DataSync a user with the necessary rights to mount and access your FSx for Windows File Server files, folders, and file metadata.

We recommend that this user belong to a Microsoft Active Directory group for administering your file system. The specifics of this group depends on your Active Directory setup:

- If you're using AWS Directory Service for Microsoft Active Directory with FSx for Windows File Server, the user must be a member of the **AWS Delegated FSx Administrators** group.
- If you're using self-managed Active Directory with FSx for Windows File Server, the user must be a member of one of two groups:
  - The **Domain Admins** group, which is the default delegated administrators group.
  - A custom delegated administrators group with user rights that allow DataSync to copy object ownership permissions and Windows access control lists (ACLs).

> **Important**
>
> You can't change the delegated administrators group after the file system has been deployed. You must either redeploy the file system or restore it from a backup to use the custom delegated administrator group with the following user rights that DataSync needs to copy metadata.

User right	Description
Restore files and directories (`SE_RESTORE_NAME`)	Allows DataSync to copy object ownership, permissions, file metadata, and NTFS discretionary access lists (DACLs). This user right is usually granted to members of the **Domain Admins** and **Backup Operators** groups (both of which are default Active Directory groups).

User right	Description
Manage auditing and security log (`SE_SECURITY_NAME `)	Allows DataSync to copy NTFS system access control lists (SACLs). This user right is usually granted to members of the **Domain Admins** group.

- If you want to copy Windows ACLs and are transferring between an SMB file server and FSx for Windows File Server file system or between FSx for Windows File Server file systems, the users that you provide DataSync must belong to the same Active Directory domain or have an Active Directory trust relationship between their domains.

> **Warning**
>
> Your FSx for Windows File Server file system's SYSTEM user must have **Full control** permissions on all folders in your file system. Do not change the NTFS ACL permissions for this user on your folders. If you do, DataSync can change your file system's permissions in a way that makes your file share inaccessible and prevents file system backups from being usable. For more information on file- and folder-level access, see the *Amazon FSx for Windows File Server User Guide*.

Required authentication protocols

Your FSx for Windows File Server must use NTLM authentication for DataSync to access it. DataSync can't access a file server that uses Kerberos authentication.

DFS Namespaces

DataSync doesn't support Microsoft Distributed File System (DFS) Namespaces. We recommend specifying an underlying file server or share instead when creating your DataSync location.

For more information, see Grouping multiple file systems with DFS Namespaces in the *Amazon FSx for Windows File Server User Guide*.

Creating your FSx for Windows File Server transfer location

Before you begin, make sure that you have an existing FSx for Windows File Server in your AWS Region. For more information, see Getting started with Amazon FSx in the *Amazon FSx for Windows File Server User Guide*.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon FSx**.
4. For **FSx file system**, choose the FSx for Windows File Server file system that you want to use as a location.
5. For **Share name**, enter a mount path for your FSx for Windows File Server using forward slashes.

   This specifies the path where DataSync reads or writes data (depending on if this is a source or destination location).

   You can also include subdirectories (for example, `/path/to/directory`).
6. For **Security groups**, choose up to five Amazon EC2 security groups that provide access to your file system's preferred subnet.

   The security groups that you choose must be able to communicate with your file system's security groups. For information about configuring security groups for file system access, see the *Amazon FSx for Windows File Server User Guide*.

   > **Note**
   >
   > If you choose a security group that doesn't allow connections from within itself, do one of the following:
   >
   > - Configure the security group to allow it to communicate within itself.
   > - Choose a different security group that can communicate with the mount target's security group.
7. For **User**, enter the name of a user that can access your FSx for Windows File Server.

For more information, see Required permissions.

8. For **Password**, enter password of the user name.
9. (Optional) For **Domain**, enter the name of the Windows domain that your FSx for Windows File Server file system belongs to.

   If you have multiple Active Directory domains in your environment, configuring this setting makes sure that DataSync connects to the right file system.
10. (Optional) Enter values for the **Key** and **Value** fields to tag the FSx for Windows File Server.

    Tags help you manage, filter, and search for your AWS resources. We recommend creating at least a name tag for your location.
11. Choose **Create location**.

Using the AWS CLI

To create an FSx for Windows File Server location by using the AWS CLI

- Use the following command to create an Amazon FSx location.

```
aws datasync create-location-fsx-windows \
    --fsx-filesystem-arn arn:aws:fsx:region:account-id:file-system/filesystem-id \
    --security-group-arns arn:aws:ec2:region:account-id:security-group/group-id \
    --user smb-user --password password
```

In the `create-location-fsx-windows` command, do the following:

- `fsx-filesystem-arn` – Specify the Amazon Resource Name (ARN) of the file system that you want to transfer to or from.
- `security-group-arns` – Specify the ARNs of up to five Amazon EC2 security groups that provide access to your file system's preferred subnet.

  The security groups that you specify must be able to communicate with your file system's security groups. For information about configuring security groups for file system access, see the *Amazon FSx for Windows File Server User Guide*.

> **Note**
>
> If you choose a security group that doesn't allow connections from within itself, do one of the following:
>
> - Configure the security group to allow it to communicate within itself.
> - Choose a different security group that can communicate with the mount target's security group.

- The AWS Region – The Region that you specify is the one where your target Amazon FSx file system is located.

The preceding command returns a location ARN similar to the one shown following.

```
{
    "LocationArn": "arn:aws:datasync:us-west-2:111222333444:location/
loc-07db7abfc326c50fb"
}
```

Configuring DataSync transfers with FSx for Lustre

To transfer data to or from your Amazon FSx for Lustre file system, you must create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to FSx for Lustre file systems

DataSync accesses your FSx for Lustre file system using the Lustre client. DataSync requires access to all data on your FSx for Lustre file system. To have this level of access, DataSync mounts your file system as the root user using a user ID (UID) and group ID (GID) of `0`.

DataSync mounts your file system from your virtual private cloud (VPC) using network interfaces. DataSync fully manages the creation, the use, and the deletion of these network interfaces on your behalf.

> **Note**
>
> VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.

Creating your FSx for Lustre transfer location

To create the transfer location, you need an existing FSx for Lustre file system. For more information, see Getting started with Amazon FSx for Lustre in the *Amazon FSx for Lustre User Guide*.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon FSx**.

   You configure this location as a source or destination later.
4. For **FSx file system**, choose the FSx for Lustre file system that you want to use as a location.
5. For **Mount path**, enter the mount path for your FSx for Lustre file system.

   The path can include a subdirectory. When the location is used as a source, DataSync reads data from the mount path. When the location is used as a destination, DataSync writes all data to the mount path. If a subdirectory isn't provided, DataSync uses the root directory (*/*).
6. For **Security groups**, choose up to five security groups that provide access to your FSx for Lustre file system.

   The security groups must be able to access the file system's ports. The file system must also allow access from the security groups.

   For more information about security groups, see File System Access Control with Amazon VPC in the *Amazon FSx for Lustre User Guide*.
7. (Optional) Enter values for the **Key** and **Value** fields to tag the FSx for Lustre file system.

   Tags help you manage, filter, and search for your AWS resources. We recommend creating at least a name tag for your location.
8. Choose **Create location**.

Using the AWS CLI

To create an FSx for Lustre location by using the AWS CLI

- Use the following command to create an FSx for Lustre location.

```
aws datasync create-location-fsx-lustre \
    --fsx-filesystem-arn arn:aws:fsx:region:account-id:file-system:filesystem-id \
    --security-group-arns arn:aws:ec2:region:account-id:security-group/group-id
```

  The following parameters are required in the `create-location-fsx-lustre` command.

  - `fsx-filesystem-arn` – The fully qualified Amazon Resource Name (ARN) of the file system that you want to read from or write to.
  - `security-group-arns` – The ARN of an Amazon EC2 security group to apply to the network interfaces of the file system's preferred subnet.

The preceding command returns a location ARN similar to the following.

```
{
    "LocationArn": "arn:aws:datasync:us-west-2:111222333444:location/
loc-07sb7abfc326c50fb"
}
```

Configuring DataSync transfers with Amazon FSx for OpenZFS

To transfer data to or from your Amazon FSx for OpenZFS file system, you must create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to FSx for OpenZFS file systems

DataSync mounts your FSx for OpenZFS file system from your virtual private cloud (VPC) using network interfaces. DataSync fully manages the creation, the use, and the deletion of these network interfaces on your behalf.

> **Note**
>
> VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.

Configuring FSx for OpenZFS file system authorization

DataSync accesses your FSx for OpenZFS file system as an NFS client, mounting the file system as a root user with a user ID (UID) and group ID (GID) of `0`.

For DataSync to copy all of your file metadata, you must configure the NFS export settings on your file system volumes using `no_root_squash`. However, you can limit this level of access to only a specific DataSync task.

For more information, see Volume properties in the *Amazon FSx for OpenZFS User Guide*.

Configuring NFS exports specific to DataSync (recommended)

You can configure an NFS export specific to each volume that's accessed only by your DataSync task. Do this for the most recent ancestor volume of the mount path that you specify when creating your FSx for OpenZFS location.

To configure an NFS export specific to DataSync

1. Create your DataSync task.

   This creates the task's network interfaces that you specify in your NFS export settings.
2. Locate the private IP addresses of the task's network interfaces by using the Amazon EC2 console or AWS CLI.
3. For your FSx for OpenZFS file system volume, configure the following NFS export settings for each of the task's network interfaces:

   - **Client address**: Enter the network interface's private IP address (for example, *`10.24.34.0`*).
   - **NFS options**: Enter `rw,no_root_squash`.

Configuring NFS exports for all clients

You can specify an NFS export that allows root access to all clients.

To configure an NFS export for all clients

- For your FSx for OpenZFS file system volume, configure the following NFS export settings:
  - **Client address**: Enter `*`.
  - **NFS options**: Enter `rw,no_root_squash`.

Creating your FSx for OpenZFS transfer location

To create the location, you need an existing FSx for OpenZFS file system. If you don't have one, see Getting started with Amazon FSx for OpenZFS in the *Amazon FSx for OpenZFS User Guide*.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Locations**, and then choose **Create location**.
3. For **Location type**, choose **Amazon FSx**.

   You configure this location as a source or destination later.
4. For **FSx file system**, choose the FSx for OpenZFS file system that you want to use as a location.
5. For **Mount path**, enter the mount path for your FSx for OpenZFS file system.

   The path must begin with `/fsx` and can be any existing directory path in the file system. When the location is used as a source, DataSync reads data from the mount path. When the location is used as a destination, DataSync writes all data to the mount path. If a subdirectory isn't provided, DataSync uses the root volume directory (for example, `/fsx`).
6. For **Security groups**, choose up to five security groups that provide network access to your FSx for OpenZFS file system.

   The security groups must provide access to the network ports that are used by the FSx for OpenZFS file system. The file system must allow network access from the security groups.

   For more information about security groups, see File system access control with Amazon VPC in the *Amazon FSx for OpenZFS User Guide*.
7. (Optional) Expand **Additional settings** and for **NFS version** choose the NFS version that DataSync uses to access your file system.

   By default, DataSync uses NFS version 4.1.

8. (Optional) Enter values for the **Key** and **Value** fields to tag the FSx for OpenZFS file system.

   Tags help you manage, filter, and search for your location. We recommend creating at least a name tag for your location.

9. Choose **Create location**.

Using the AWS CLI

To create an FSx for OpenZFS location by using the AWS CLI

1. Copy the following `create-location-fsx-open-zfs` command:

```
aws datasync create-location-fsx-open-zfs \
   --fsx-filesystem-arn arn:aws:fsx:region:account-id:file-system/filesystem-id \
   --security-group-arns arn:aws:ec2:region:account-id:security-group/group-id \
   --protocol NFS={}
```

2. Specify the following required options in the command:

   - For `fsx-filesystem-arn`, specify the location file system's fully qualified Amazon Resource Name (ARN). This includes the AWS Region where your file system resides, your AWS account, and the file system ID.
   - For `security-group-arns`, specify the ARN of the Amazon EC2 security group that provides access to the network interfaces of your FSx for OpenZFS file system's preferred subnet. This includes the AWS Region where your Amazon EC2 instance resides, your AWS account, and the security group ID.

     For more information about security groups, see File System Access Control with Amazon VPC in the *Amazon FSx for OpenZFS User Guide*.
   - For `protocol`, specify the protocol that DataSync uses to access your file system. (DataSync currently supports only NFS.)

3. Run the command. You get a response showing the location that you just created.

```
{
    "LocationArn": "arn:aws:datasync:us-west-2:123456789012:location/loc-
abcdef01234567890"
}
```

Configuring transfers with Amazon FSx for NetApp ONTAP

To transfer data to or from your Amazon FSx for NetApp ONTAP file system, you must create an AWS DataSync transfer *location*. DataSync can use this location as a source or destination for transferring data.

Providing DataSync access to FSx for ONTAP file systems

To access an FSx for ONTAP file system, DataSync mounts a storage virtual machine (SVM) on your file system using network interfaces in your virtual private cloud (VPC). DataSync creates these network interfaces in your file system's preferred subnet only when you create a task that includes your FSx for ONTAP location.

> **Note**
>
> VPCs that you use with DataSync must have default tenancy. VPCs with dedicated tenancy aren't supported.

DataSync can connect to an FSx for ONTAP file system's SVM and copy data by using the Network File System (NFS) or Server Message Block (SMB) protocol.

Topics

Using the NFS protocol

With the NFS protocol, DataSync uses the AUTH_SYS security mechanism with a user ID (UID) and group ID (GID) of `0` to authenticate with your SVM.

> **Note**
>
> DataSync currently only supports NFS version 3 with FSx for ONTAP locations.

Using the SMB protocol

With the SMB protocol, DataSync uses credentials that you provide to authenticate with your SVM.

Supported SMB versions

By default, DataSync automatically chooses a version of the SMB protocol based on negotiation with your SMB file server. You also can configure DataSync to use a specific version, but we recommend doing this only if DataSync has trouble negotiating with the SMB file server automatically. For security reasons, we recommend using SMB version 3.0.2 or later.

See the following table for a list of options in the DataSync console and API for configuring an SMB version with your FSx for ONTAP location:

Console option	API option	Description
Automatic	`AUTOMATIC`	DataSync and the SMB file server negotiate the highest version of SMB that they mutually support between 2.1 and 3.1.1. This is the default and recommended option. If you instead choose a specific version that your file server doesn't support, you may get an `Operation Not Supported` error.
SMB 3.0.2	`SMB3`	Restricts the protocol negotiation to only SMB version 3.0.2.
SMB 2.1	`SMB2`	Restricts the protocol negotiation to only SMB version 2.1.
SMB 2.0	`SMB2_0`	Restricts the protocol negotiation to only SMB version 2.0.

Required permissions

You must provide DataSync a local user in your SVM or a domain user in your Microsoft Active Directory with the necessary rights to mount and access your files, folders, and file metadata.

If you provide a user in your Active Directory, note the following:

- If you're using AWS Directory Service for Microsoft Active Directory, the user must be a member of the **AWS Delegated FSx Administrators** group.
- If you're using a self-managed Active Directory, the user must be a member of one of two groups:
  - The **Domain Admins** group, which is the default delegated administrators group.
  - A custom delegated administrators group with user rights that allow DataSync to copy object ownership permissions and Windows access control lists (ACLs).

  > **Important**
  >
  > You can't change the delegated administrators group after the file system has been deployed. You must either redeploy the file system or restore it from a backup to use the custom delegated administrator group with the following user rights that DataSync needs to copy metadata.

User right	Description
Act as part of the operating system (`SE_TCB_NAME `)	Allows DataSync to copy object ownership , permissions, file metadata, and NTFS discretionary access lists (DACLs). This user right is usually granted to members of the **Domain Admins** and **Backup Operators** groups (both of which are default Active Directory groups).
Manage auditing and security log (`SE_SECURITY_NAME `)	Allows DataSync to copy NTFS system access control lists (SACLs). This user right is usually granted to members of the **Domain Admins** group.

- If you want to copy Windows ACLs and are transferring between FSx for ONTAP file systems using SMB (or other types of file systems using SMB), the users that you provide DataSync must belong to the same Active Directory domain or have an Active Directory trust relationship between their domains.

Required authentication protocols

For DataSync to access your SMB share, your FSx for ONTAP file system must use NTLM authentication. DataSync can't access FSx for ONTAP file systems that use Kerberos authentication.

DFS Namespaces

DataSync doesn't support Microsoft Distributed File System (DFS) Namespaces. We recommend specifying an underlying file server or share instead when creating your DataSync location.

Unsupported protocols

DataSync can't access FSx for ONTAP file systems using the iSCSI (Internet Small Computer Systems Interface) protocol.

Choosing the right protocol

To preserve file metadata in FSx for ONTAP migrations, configure your DataSync source and destination locations to use the same protocol. Between the supported protocols, SMB preserves metadata with the highest fidelity (see Understanding how DataSync handles file and object metadata for details).

When migrating from a Unix (Linux) server or network-attached storage (NAS) share that serves users through NFS, do the following:

1. Create an NFS location for the Unix (Linux) server or NAS share. (This will be your source location.)
2. Configure the FSx for ONTAP volume you're transferring data to with the Unix security style.
3. Create a location for your FSx for ONTAP file system that's configured for NFS. (This will be your destination location.)

When migrating from a Windows server or NAS share that serves users through SMB, do the following:

1. Create an SMB location for the Windows server or NAS share. (This will be your source location.)
2. Configure the FSx for ONTAP volume you're transferring data to with the NTFS security style.
3. Create a location for your FSx for ONTAP file system that's configured for SMB. (This will be your destination location.)

If your FSx for ONTAP environment uses multiple protocols, we recommend working with an AWS storage specialist. To learn about best practices for multiprotocol access, see Enabling multiprotocol workloads with Amazon FSx for NetApp ONTAP.

Accessing SnapLock volumes

If you're transferring data to a SnapLock volume on an FSx for ONTAP file system, make sure the SnapLock settings **Autocommit** and **Volume append mode** are disabled on the volume during your transfer. You can re-enable these settings when you're done transferring data.

Creating your FSx for ONTAP transfer location

To create the location, you need an existing FSx for ONTAP file system. If you don't have one, see Getting started with Amazon FSx for NetApp ONTAP in the *Amazon FSx for NetApp ONTAP User Guide*.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Amazon FSx**.

   You configure this location as a source or destination later.
4. For **FSx file system**, choose the FSx for ONTAP file system that you want to use as a location.
5. For **Storage virtual machine**, choose a storage virtual machine (SVM) in your file system where you want to copy data to or from.
6. For **Mount path**, specify a path to the file share in that SVM where you'll copy your data.

   You can specify a junction path (also known as a mount point), qtree path (for NFS file shares), or share name (for SMB file shares). For example, your mount path might be `/vol1`, `/vol1/tree1`, or `/share1`.

   > **Tip**
   >
   > Don't specify a path in the SVM's root volume. For more information, see Managing FSx for ONTAP storage virtual machines in the *Amazon FSx for NetApp ONTAP User Guide*.
7. For **Security groups**, choose up to five Amazon EC2 security groups that provide access to your file system's preferred subnet.

The security groups must allow outbound traffic on the following ports (depending on the protocol you use):

- **NFS** – TCP ports 111, 635, and 2049
- **SMB** – TCP port 445

Your file system's security groups must also allow inbound traffic on the same ports.

8. For **Protocol**, choose the data transfer protocol that DataSync uses to access your file system's SVM.

   For more information, see Choosing the right protocol.

   NFS

   DataSync uses NFS version 3.

   SMB

   Configure an SMB version, user, password, and Active Directory domain name (if needed) to access the SVM.

   - (Optional) Expand **Additional settings** and choose an **SMB version** for DataSync to use when accessing your SVM.

     By default, DataSync automatically chooses a version based on negotiation with the SMB file server. For more information, see Using the SMB protocol.
   - For **User**, enter a user name that can mount and access the files, folders, and metadata that you want to transfer in the SVM.

     For more information, see Using the SMB protocol.
   - For **Password**, enter the password of the user that you specified that can access the SVM.
   - (Optional) For **Active Directory domain name**, enter the fully qualified domain name (FQDN) of the Active Directory that your SVM belongs to.

     If you have multiple domains in your environment, configuring this setting makes sure that DataSync connects to the right SVM.
9. (Optional) Enter values for the **Key** and **Value** fields to tag the FSx for ONTAP file system.

Tags help you manage, filter, and search for your AWS resources. We recommend creating at least a name tag for your location.

10. Choose **Create location**.

Using the AWS CLI

To create an FSx for ONTAP location by using the AWS CLI

1. Copy the following `create-location-fsx-ontap` command:

```
aws datasync create-location-fsx-ontap \
   --storage-virtual-machine-arn arn:aws:fsx:region:account-id:storage-virtual-
machine/fs-file-system-id \
   --security-group-arns arn:aws:ec2:region:account-id:security-group/group-id \
   --protocol data-transfer-protocol={}
```

2. Specify the following required options in the command:

   - For `storage-virtual-machine-arn`, specify the fully qualified Amazon Resource Name (ARN) of a storage virtual machine (SVM) in your file system where you want to copy data to or from.

     This ARN includes the AWS Region where your file system resides, your AWS account, and the file system and SVM IDs.

   - For `security-group-arns`, specify the ARNs of the Amazon EC2 security groups that provide access to the network interfaces of your file system's preferred subnet.

     This includes the AWS Region where your Amazon EC2 instance resides, your AWS account, and your security group IDs. You can specify up to five security group ARNs.

     For more information about security groups, see File System Access Control with Amazon VPC in the *Amazon FSx for NetApp ONTAP User Guide*.

   - For `protocol`, configure the protocol that DataSync uses to access your file system's SVM.

     - For NFS, you can use the default configuration:

       ```
       --protocol NFS={}
       ```

     - For SMB, you must specify a user name and password that can access the SVM:

```
    --protocol SMB={User=smb-user,Password=smb-password}
```

3. Run the command.

   You get a response that shows the location that you just created.

```
{
    "LocationArn": "arn:aws:datasync:us-west-2:123456789012:location/loc-
abcdef01234567890"
}
```

Transferring to or from other cloud storage with AWS DataSync

With AWS DataSync, you can transfer data between some other cloud providers and AWS storage services. For more information, see Where can I transfer my data with DataSync?

Topics

- Planning transfers to or from third-party cloud storage systems
- Configuring AWS DataSync transfers with Google Cloud Storage
- Configuring transfers with Microsoft Azure Blob Storage
- Configuring AWS DataSync transfers with Microsoft Azure Files SMB shares
- Configuring transfers with other cloud object storage

Planning transfers to or from third-party cloud storage systems

When planning cross-cloud data transfers, consider the following:

- **Using an agent:** An agent is only required to access storage in other clouds when using Basic mode tasks. Enhanced mode tasks do not require an agent. If you decide to use an agent, you can deploy it as an Amazon EC2 instance when transferring from a cloud providers' S3-compatible object storage, or as a Google Compute Engine or Azure Virtual Machine for transfers from those specific storage services, respectively. When transferring from filesystems in Google and Azure, we recommend deploying the agent as a Google or Azure VM so that the agent is as close to the filesystem as possible. Additionally, DataSync compresses the data from the agent to AWS, which can help reduce egress costs. DataSync provides a list of validated cloud locations that provide the required Amazon S3 API compatibility.

- **The other cloud's object storage endpoint:** The storage endpoint for a third-party cloud provider is typically region or account specific. The regional endpoint is used as the server in the DataSync object storage location, together with a specified bucket name.
- **Storage classes of the source objects:** Like Amazon S3, some cloud providers support an archive tier that requires a restore before being able to access the archived objects. For example, objects in the Azure Blob archive tier must be retrieved for standard access prior to a data transfer. Objects in the Google Cloud Storage archive tier can be accessed immediately and do not require restore, but there are retrieval costs associated with direct archive tier access. Review your cross-cloud storage class documentation to determine access requirements and retrieval fees prior to beginning your data transfer. For more information about restoring archived objects in Amazon S3, see Restoring an archived object in the *Amazon Simple Storage Service User Guide*.
- **Object storage access:** Transferring data between third-party cloud providers requires access to the other cloud's object storage in the form of authentication keys. For example, to provide access to Google Cloud Storage, you configure a DataSync object storage location that connects to the Google Cloud Storage XML API and authenticates using a Hash-based Message Authentication Code (HMAC) key for your service account. For Azure Blob storage, you configure a dedicated Azure Blob DataSync location that authenticates using SAS tokens. DataSync uses AWS Secrets Manager to securely store your object storage credentials. For more information, see Securing storage location credentials.
- **Object tag support:**
  - Unlike Amazon S3, not all cloud providers support object tags. DataSync tasks can fail while attempting to read tags from the source location if the cloud provider does not support object tags through the Amazon S3 API, or if the credentials you provide are insufficient to retrieve the tags. DataSync provides a task option to turn off reading and copying object tags during a transfer if object tags are not supported, or you don't want to retain the tags. Review your cloud provider documentation to determine if object tags are supported, and verify your transfer task's object tag settings before initiating the transfer.
  - You can use the Amazon S3 API to check whether a cloud provider will return a `get-object-tagging` request. For more information, see get-object-tagging in the *AWS CLI Command Reference*.

    A cloud provider that supports object tags will return a response similar to the following example:

```
aws s3api get-object-tagging --bucket BUCKET_NAME --endpoint- url=https://
BUCKET_ENDPOINT --key prefix/file1
```

```
{

    "TagSet": []

}
```

A cloud provider that doesn't support `get-object-tagging` will return the following message:

```
aws s3api get-object-tagging --bucket BUCKET_NAME --endpoint- url=https://
BUCKET_ENDPOINT --key prefix/file1

An error occurred (OperationNotSupported) when calling the GetObjectTagging
 operation: The operation is not supported for this resource
```

- **Associated costs for requests and data egress:** Transferring data from cloud object storage has request and egress costs associated with reading data and data transfer out. Request charges vary between cloud providers and between storage classes where applicable. Consult your cloud provider documentation regarding specific costs for requests relative to the storage class you plan to read from. For an overview of request charges that DataSync makes for data transfers, see Evaluating S3 request costs when using DataSync and AWS DataSync pricing. Transferring data out of specific cloud providers results in egress charges. Data transfer costs vary between cloud providers and are also dependent on the region where the data is stored.
- **Object storage request rates:** Cloud providers have various performance and request rate characteristics for their object storage platforms. Review your other cloud provider's request rates and determine where the request limits are applied. Plan ahead for highly parallelized transfers consisting of multiple agents, where specific partitioning or performance increases might be required.

  Amazon S3 has documented request rates that you can build your solution around. Amazon S3 request rates are per partitioned prefix and are scalable across multiple prefixes. For more information, see Best practices design patterns: optimizing Amazon S3 performance in the *Amazon Simple Storage Service User Guide*.

Configuring AWS DataSync transfers with Google Cloud Storage

With AWS DataSync, you can transfer data between Google Cloud Storage and the following AWS storage services:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

To begin the transfer setup, create a location for your Google Cloud Storage. This location can serve as either your transfer source or destination. A DataSync agent is required only when you transfer data between Google Cloud Storage and Amazon EFS or Amazon FSx, or when using **Basic mode** tasks. **Enhanced mode** data transfers between Google Cloud Storage and Amazon S3 don't require an agent.

> **Note**
>
> For private cloud connectivity between Google Cloud Storage and AWS, use Basic mode with agents.

Overview

DataSync uses the Google Cloud Storage XML API for data transfers. This API provides an Amazon S3 compatible interface for reading and writing data with Google Cloud Storage buckets.

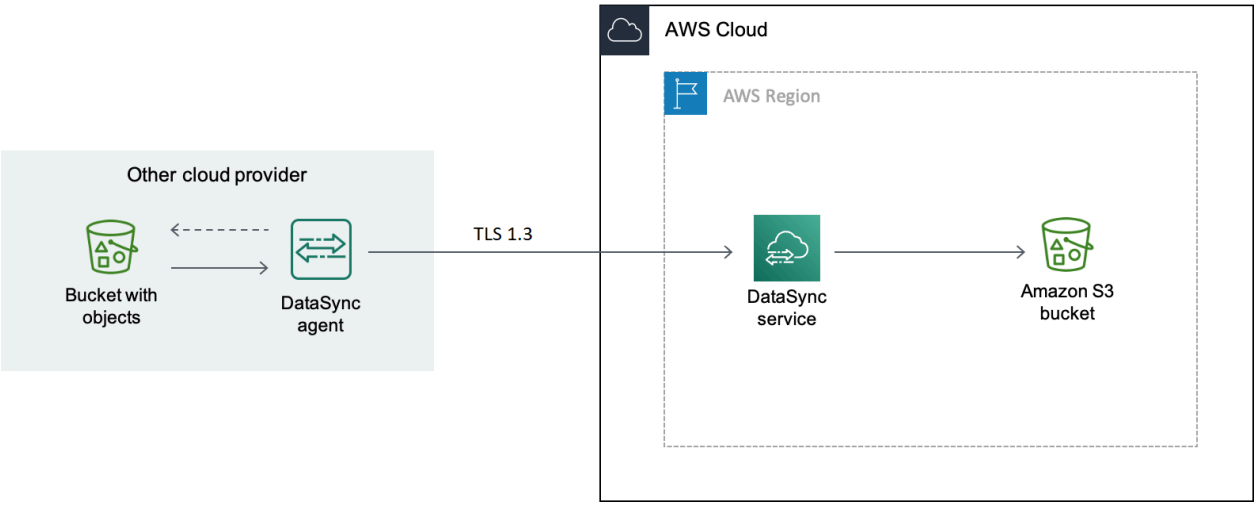
When you use Basic mode for transfers, you can deploy the agent in Google Cloud Storage or your Amazon VPC.

Agent in Google Cloud

1. You deploy a DataSync agent in your Google Cloud environment.
2. The agent reads your Google Cloud Storage bucket by using a Hash-based Message Authentication Code (HMAC) key.

3. The objects from your Google Cloud Storage bucket transfer securely through TLS 1.3 into the AWS Cloud by using a public endpoint.
4. The DataSync service writes the data to your S3 bucket.

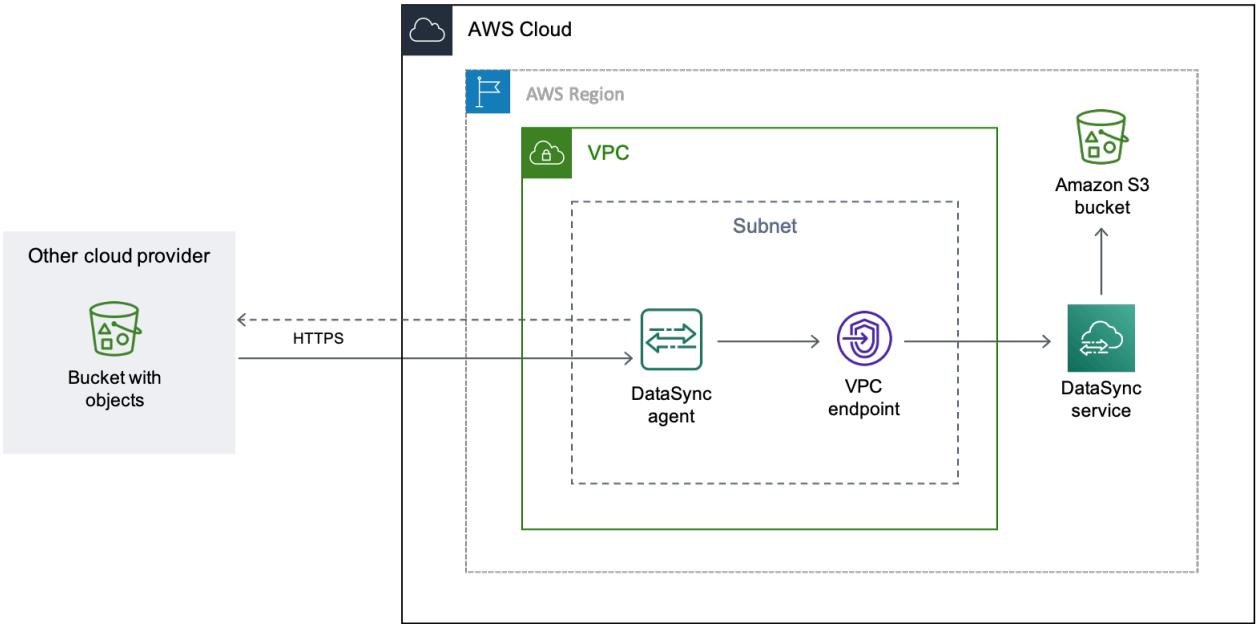
The following diagram illustrates the transfer.



Agent in your VPC

1. You deploy a DataSync agent in a virtual private cloud (VPC) in your AWS environment.
2. The agent reads your Google Cloud Storage bucket by using a Hash-based Message Authentication Code (HMAC) key.
3. The objects from your Google Cloud Storage bucket transfer securely through TLS 1.3 into the AWS Cloud by using a private VPC endpoint.
4. The DataSync service writes the data to your S3 bucket.

The following diagram illustrates the transfer.



Costs

The fees associated with this migration might include:

- Running a Google Compute Engine virtual machine (VM) instance (if you deploy your DataSync agent in Google Cloud)
- Running an Amazon EC2 instance (if you deploy your DataSync agent in a VPC within AWS)
- Transferring the data by using DataSync, including request charges related to Google Cloud Storage and Amazon S3 (if S3 is one of your transfer locations)
- Transferring data out of Google Cloud Storage
- Storing data in Amazon S3

Prerequisites

Before you begin, do the following if you haven't already:

- Create a Google Cloud Storage bucket with the objects that you want to transfer to AWS.
- Sign up for an AWS account.
- Create an Amazon S3 bucket for storing your objects after they're in AWS.

Creating an HMAC key for your Google Cloud Storage bucket

DataSync uses an HMAC key that's associated with your Google service account to authenticate with and read the bucket that you're transferring data from. (For detailed instructions on how to create HMAC keys, see the Google Cloud Storage documentation.)

To create an HMAC key

1. Create an HMAC key for your Google service account.
2. Make sure that your Google service account has at least `Storage Object Viewer` permissions.
3. Save your HMAC key's access ID and secret in a secure location.

   You'll need these items later to configure your DataSync source location.

Step 2: Configure your network

Network configuration is required only when using a DataSync agent with your transfer. The network requirements for this migration depend on where you choose to deploy your agent.

For a DataSync agent in Google Cloud

If you want to host your DataSync agent in Google Cloud, configure your network to allow DataSync transfers through a public endpoint.

For a DataSync agent in your VPC

If you want to host your agent in AWS, you need a VPC with an interface endpoint. DataSync uses the VPC endpoint to facilitate the transfer.

To configure your network for a VPC endpoint

1. If you don't have one, create a VPC in the same AWS Region as your S3 bucket.
2. Create a private subnet for your VPC.
3. Create a VPC service endpoint for DataSync.
4. Configure your network to allow DataSync transfers through a VPC service endpoint.

   To do this, modify the security group that's associated with your VPC service endpoint.

Step 3: Create a DataSync agent (optional)

A DataSync agent is only required when using **Basic** mode tasks. If you are using **Enhanced** mode to transfer between Google Cloud Storage (GCS) and Amazon S3, then no agent is required. If you want to use **Basic** mode, then you need a DataSync agent that can access your GCS bucket.

For Google Cloud

In this scenario, the DataSync agent runs in your Google Cloud environment.

Before you begin: Install the Google Cloud CLI.

To create the agent for Google Cloud

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, then choose **Create agent**.
3. For **Hypervisor**, choose **VMware ESXi**, then choose **Download the image** to download a `.zip` file that contains the agent.
4. Open a terminal. Unzip the image by running the following command:

   ```
   unzip AWS-DataSync-Agent-VMWare.zip
   ```

5. Extract the contents of the agent's `.ova` file beginning with `aws-datasync` by running the following command:

   ```
   tar -xvf aws-datasync-2.0.1655755445.1-x86_64.xfs.gpt.ova
   ```

6. Import the agent's `.vmdk` file into Google Cloud by running the following Google Cloud CLI command:

   ```
   gcloud compute images import aws-datasync-2-test \
      --source-file INCOMPLETE-aws-datasync-2.0.1655755445.1-x86_64.xfs.gpt-disk1.vmdk
    \
      --os centos-7
   ```

   > **Note**
   >
   > Importing the `.vmdk` file might take up to two hours.

7. Create and start a VM instance for the agent image that you just imported.

The instance needs the following configurations for your agent. (For detailed instructions on how to create an instance, see the Google Cloud Compute Engine documentation.)

- For the machine type, choose one of the following:
  - **e2-standard-8** – For DataSync task executions working with up to 20 million objects.
  - **e2-standard-16** – For DataSync task executions working with more than 20 million objects.
- For the boot disk settings, go to the custom images section. Then choose the DataSync agent image that you just imported.
- For the service account setting, choose your Google service account (the same account that you used in Step 1).
- For the firewall setting, choose the option to allow HTTP (port 80) traffic.

  To activate your DataSync agent, port 80 must be open on the agent. The port doesn't need to be publicly accessible. Once activated, DataSync closes the port.

8. After the VM instance is running, take note of its public IP address.

   You'll need this IP address to activate the agent.

9. Go back to the DataSync console. On the **Create agent** screen where you downloaded the agent image, do the following to activate your agent:
   - For **Endpoint type**, choose the public service endpoints option (for example, **Public service endpoints in US East Ohio**).
   - For **Activation key**, choose **Automatically get the activation key from your agent**.
   - For **Agent address**, enter the public IP address of the agent VM instance that you just created.
   - Choose **Get key**.
10. Give your agent a name, and then choose **Create agent**.

Your agent is online and ready to transfer data.

For your VPC

In this scenario, the agent runs as an Amazon EC2 instance in a VPC that's associated with your AWS account.

Before you begin: Set up the AWS Command Line Interface (AWS CLI).

To create the agent for your VPC

1. Open a terminal. Make sure to configure your AWS CLI profile to use the account that's associated with your S3 bucket.
2. Copy the following command. Replace *vpc-region* with the AWS Region where your VPC resides (for example, `us-east-1`).

   ```
   aws ssm get-parameter --name /aws/service/datasync/ami --region vpc-region
   ```

3. Run the command. In the output, take note of the `"Value"` property.

   This value is the DataSync Amazon Machine Image (AMI) ID of the Region that you specified. For example, an AMI ID could look like `ami-1234567890abcdef0`.
4. Copy the following URL. Again, replace *vpc-region* with the AWS Region where your VPC resides. Then, replace *ami-id* with the AMI ID that you noted in the previous step.

   ```
   https://console.aws.amazon.com/ec2/v2/home?region=vpc-
   region#LaunchInstanceWizard:ami=ami-id
   ```

5. Paste the URL into a browser.

   The Amazon EC2 instance launch page in the AWS Management Console displays.
6. For **Instance type**, choose one of the recommended Amazon EC2 instances for DataSync agents.
7. For **Key pair**, choose an existing key pair, or create a new one.
8. For **Network settings**, choose the VPC and subnet where you want to deploy the agent.
9. Choose **Launch instance**.
10. Once the Amazon EC2 instance is running, choose your VPC endpoint.
11. Activate your agent.

Step 4: Create a DataSync source location for your Google Cloud Storage bucket

To set up a DataSync location for your Google Cloud Storage bucket, you need the access ID and secret for the HMAC key that you created in Step 1.

To create the DataSync source location

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Object storage**.
4. For **Server**, enter **`storage.googleapis.com`**.
5. For **Bucket name**, enter the name of your Google Cloud Storage bucket.
6. For **Folder**, enter an object prefix.

   DataSync only copies objects with this prefix.
7. If your transfer requires an agent, choose **Use agents**, then choose the agent that you created in Step 3.
8. Expand **Additional settings**. For **Server protocol**, choose **HTTPS**. For **Server port**, choose **443**.
9. Scroll down to the **Authentication** section. Make sure that the **Requires credentials** check box is selected, and then do the following:

   - For **Access key**, enter your HMAC key's access ID.
   - For **Secret key**, either enter your HMAC key's secret key directly, or specify an AWS Secrets Manager secret that contains the key. For more information, see Providing credentials for storage locations.
10. Choose **Create location**.

Step 5: Create a DataSync destination location for your S3 bucket

You need a DataSync location for where you want your data to end up.

To create the DataSync destination location

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. Create a DataSync location for the S3 bucket.

   If you deployed the DataSync agent in your VPC, this tutorial assumes that the S3 bucket is in the same AWS Region as your VPC and DataSync agent.

Step 6: Create and start a DataSync task

With your source and destinations locations configured, you can start moving your data into AWS.

To create and start the DataSync task

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. On the **Configure source location** page, do the following:
   a. Choose **Choose an existing location**.
   b. Choose the source location that you created in Step 4, then choose **Next**.
4. On the **Configure destination location** page, do the following:
   a. Choose **Choose an existing location**.
   b. Choose the destination location that you created in Step 5, then choose **Next**.
5. On the **Configure settings** page, do the following:
   a. Under **Data transfer configuration**, expand **Additional settings** and clear the **Copy object tags** check box.

      > **Important**
      >
      > Because the Google Cloud Storage XML API does not support reading or writing object tags, your DataSync task might fail if you try to copy object tags.

   b. Configure any other task settings that you want, and then choose **Next**.
6. On the **Review** page, review your settings, and then choose **Create task**.
7. On the task's details page, choose **Start**, and then choose one of the following:
   - To run the task without modification, choose **Start with defaults**.
   - To modify the task before running it, choose **Start with overriding options**.

When your task finishes, you'll see the objects from your Google Cloud Storage bucket in your S3 bucket.

Configuring transfers with Microsoft Azure Blob Storage

With AWS DataSync, you can transfer data between Microsoft Azure Blob Storage (including Azure Data Lake Storage Gen2 blob storage) and the following AWS storage services:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

To set up this kind of transfer, you create a location for your Azure Blob Storage. You can use this location as a transfer source or destination. A DataSync agent is required only when transferring data between Azure Blob and Amazon EFS or Amazon FSx, or when using **Basic** mode tasks. You don't need an agent to transfer data between Azure Blob and Amazon S3 using **Enhanced** mode.

Providing DataSync access to your Azure Blob Storage

How DataSync accesses your Azure Blob Storage depends on several factors, including whether you're transferring to or from blob storage and what kind of shared access signature (SAS) token you're using. Your objects also must be in an access tier that DataSync can work with.

Topics

- SAS tokens
- Access tiers

SAS tokens

A SAS token specifies the access permissions for your blob storage. (For more information about SAS, see the Azure Blob Storage documentation.)

You can generate SAS tokens to provide different levels of access. DataSync supports tokens with the following access levels:

- Account

- Container

The access permissions that DataSync needs depends on the scope of your token. Not having the correct permissions can cause your transfer to fail. For example, your transfer won't succeed if you're moving objects with tags to Azure Blob Storage but your SAS token doesn't have tag permissions.

Topics

SAS token permissions for account-level access

DataSync needs an account-level access token with the following permissions (depending on whether you're transferring to or from Azure Blob Storage).

Transfers from blob storage

- **Allowed services** – Blob
- **Allowed resource types** – Container, Object

  If you don't include these permissions, DataSync can't transfer your object metadata, including object tags.
- **Allowed permissions** – Read, List
- **Allowed blob index permissions** – Read/Write (if you want DataSync to copy object tags)

Transfers to blob storage

- **Allowed services** – Blob
- **Allowed resource types** – Container, Object

  If you don't include these permissions, DataSync can't transfer your object metadata, including object tags.
- **Allowed permissions** – Read, Write, List, Delete (if you want DataSync to remove files that aren't in your transfer source)

- **Allowed blob index permissions** – Read/Write (if you want DataSync to copy object tags)

SAS token permissions for container-level access

DataSync needs a container-level access token with the following permissions (depending on whether you're transferring to or from Azure Blob Storage).

Transfers from blob storage

- Read
- List
- Tag (if you want DataSync to copy object tags)

> **Note**
>
> You can't add the tag permission when generating a SAS token in the Azure portal. To add the tag permission, instead generate the token by using the Azure Storage Explorer app or generate a SAS token that provides account-level access.

Transfers to blob storage

- Read
- Write
- List
- Delete (if you want DataSync to remove files that aren't in your transfer source)
- Tag (if you want DataSync to copy object tags)

> **Note**
>
> You can't add the tag permission when generating a SAS token in the Azure portal. To add the tag permission, instead generate the token by using the Azure Storage Explorer app or generate a SAS token that provides account-level access.

SAS expiration policies

Make sure that your SAS doesn't expire before you expect to finish your transfer. For information about configuring a SAS expiration policy, see the Azure Blob Storage documentation.

If the SAS expires during the transfer, DataSync can no longer access your Azure Blob Storage location. (You might see a Failed to open directory error.) If this happens, update your location with a new SAS token and restart your DataSync task.

Access tiers

When transferring from Azure Blob Storage, DataSync can copy objects in the hot and cool tiers. For objects in the archive access tier, you must rehydrate those objects to the hot or cool tier before you can copy them.

When transferring to Azure Blob Storage, DataSync can copy objects into the hot, cool, and archive access tiers. If you're copying objects into the archive access tier, DataSync can't verify the transfer if you're trying to verify all data in the destination.

DataSync doesn't support the cold access tier. For more information about access tiers, see the Azure Blob Storage documentation.

Considerations with Azure Blob Storage transfers

When planning to transfer data to or from Azure Blob Storage with DataSync, there are some things to keep in mind.

Topics

Costs

The fees associated with moving data in or out of Azure Blob Storage can include:

- Running an Azure virtual machine (VM) (if you deploy a DataSync agent in Azure)
- Running an Amazon EC2 instance (if you deploy a DataSync agent in a VPC within AWS)
- Transferring the data by using DataSync, including request charges related to Azure Blob Storage and Amazon S3 (if S3 is one of your transfer locations)
- Transferring data in or out of Azure Blob Storage
- Storing data in an AWS storage service supported by DataSync

Blob types

How DataSync works with blob types depends on whether you're transferring to or from Azure Blob Storage. When you're moving data into blob storage, the objects or files that DataSync transfers can only be block blobs. When you're moving data out of blob storage, DataSync can transfer block, page, and append blobs.

For more information about blob types, see the Azure Blob Storage documentation.

AWS Region availability

You can create an Azure Blob Storage transfer location in any AWS Region that's supported by DataSync.

Copying object tags

The ability for DataSync to preserve object tags when transferring to or from Azure Blob Storage depends on the following factors:

- **The size of an object's tags** – DataSync can't transfer an object with tags that exceed 2 KB.
- **Whether DataSync is configured to copy object tags** – DataSync copies object tags by default.
- **The namespace that your Azure storage account uses** – DataSync can copy object tags if your Azure storage account uses a flat namespace but not if your account uses a hierarchical namespace (a feature of Azure Data Lake Storage Gen2). Your DataSync task will fail if you try to copy object tags and your storage account uses a hierarchical namespace.
- **Whether your SAS token authorizes tagging** – The permissions that you need to copy object tags vary depending on the level of access that your token provides. Your task will fail if you try to copy object tags and your token doesn't have the right permissions for tagging. For more information, check the permission requirements for account-level access tokens or container-level access tokens.

Transferring to Amazon S3

When transferring to Amazon S3, DataSync won't transfer Azure Blob Storage objects larger than 5 TB or objects with metadata larger than 2 KB.

Deleting directories in a transfer destination

When transferring to Azure Blob Storage, DataSync can remove objects in your blob storage that aren't present in your transfer source. (You can configure this option by clearing the **Keep deleted files** setting in the DataSync console. Your SAS token must also have delete permissions.)

When you configure your transfer this way, DataSync won't delete directories in your blob storage if your Azure storage account is using a hierarchical namespace. In this case, you must manually delete the directories (for example, by using Azure Storage Explorer).

Limitations

Remember the following limitations when transferring data to or from Azure Blob Storage:

- DataSync creates some directories in a location to help facilitate your transfer. If Azure Blob Storage is a destination location and your storage account uses a hierarchical namespace, you might notice task-specific subdirectories (such as `task-000011112222abcde`) in the `/.aws-datasync` folder. DataSync typically deletes these subdirectories following a transfer. If that doesn't happen, you can delete these task-specific directories yourself as long as a task isn't running.
- DataSync doesn't support using a SAS token to access only a specific folder in your Azure Blob Storage container.
- You can't provide DataSync a user delegation SAS token for accessing your blob storage.

Creating your DataSync agent (optional)

A DataSync agent is required only when transferring data between Azure Blob and Amazon EFS or Amazon FSx, or when using **Basic** mode tasks. You don't need an agent to transfer data between Azure Blob and Amazon S3 using **Enhanced** mode. This section describes how to deploy and activate an agent.

> **Tip**
>
> Although you can deploy your agent on an Amazon EC2 instance, using a Microsoft Hyper-V agent might result in decreased network latency and more data compression.

Microsoft Hyper-V agents

You can deploy your DataSync agent directly in Azure with a Microsoft Hyper-V image.

> **Tip**
>
> Before you continue, consider using a shell script that might help you deploy your Hyper-V agent in Azure quicker. You can get more information and download the code on GitHub. If you use the script, you can skip ahead to the section about Getting your agent's activation key.

Topics

Prerequisites

To prepare your DataSync agent and deploy it in Azure, you must do the following:

- Enable Hyper-V on your local machine.
- Install PowerShell (including the Hyper-V Module).
- Install the Azure CLI.
- Install AzCopy.

Downloading and preparing your agent

Download an agent from the DataSync console. Before you can deploy the agent in Azure, you must convert it to a fixed-size virtual hard disk (VHD). For more information, see the Azure documentation.

To download and prepare your agent

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.
3. For **Hypervisor**, choose **Microsoft Hyper-V**, and then choose **Download the image**.

   The agent downloads in a `.zip` file that contains a `.vhdx` file.
4. Extract the `.vhdx` file on your local machine.
5. Open PowerShell and do the following:

   a. Copy the following `Convert-VHD` cmdlet:

   ```
   Convert-VHD -Path .\local-path-to-vhdx-file\aws-datasync-2.0.1686143940.1-
   x86_64.xfs.gpt.vhdx `
   -DestinationPath .\local-path-to-vhdx-file\aws-datasync-2016861439401-
   x86_64.vhd -VHDType Fixed
   ```

   b. Replace each instance of *`local-path-to-vhdx-file`* with the location of the `.vhdx` file on your local machine.

   c. Run the command.

   Your agent is now a fixed-size VHD (with a `.vhd` file format) and ready to deploy in Azure.

Deploying your agent in Azure

Deploying your DataSync agent in Azure involves:

- Creating a managed disk in Azure
- Uploading your agent to that managed disk
- Attaching the managed disk to a Linux virtual machine

To deploy your agent in Azure

1. In PowerShell, go to the directory that contains your agent's `.vhd` file.
2. Run the `ls` command and save the `Length` value (for example, 85899346432).

   This is the size of your agent image in bytes, which you need when creating a managed disk that can hold the image.
3. Do the following to create a managed disk:

   a. Copy the following Azure CLI command:

   ```
   az disk create -n your-managed-disk `
   -g your-resource-group `
   -l your-azure-region `
   --upload-type Upload `
   --upload-size-bytes agent-size-bytes `
   --sku standard_lrs
   ```

   b. Replace *your-managed-disk* with a name for your managed disk.

   c. Replace *your-resource-group* with the name of the Azure resource group that your storage account belongs to.

   d. Replace *your-azure-region* with the Azure region where your resource group is located.

   e. Replace *agent-size-bytes* with the size of your agent image.

   f. Run the command.

   This command creates an empty managed disk with a standard SKU where you can upload your DataSync agent.
4. To generate a shared access signature (SAS) that allows write access to the managed disk, do the following:

   a. Copy the following Azure CLI command:

   ```
   az disk grant-access -n your-managed-disk `
   -g your-resource-group `
   --access-level Write `
   --duration-in-seconds 86400
   ```

b. Replace *your-managed-disk* with the name of the managed disk that you created.

c. Replace *your-resource-group* with the name of the Azure resource group that your storage account belongs to.

d. Run the command.

In the output, take note of the SAS URI. You need this URI when uploading the agent to Azure.

The SAS allows you to write to the disk for up to an hour. This means that you have an hour to upload your agent to the managed disk.

5. To upload your agent to your managed disk in Azure, do the following:

a. Copy the following `AzCopy` command:

```
.\azcopy copy local-path-to-vhd-file sas-uri --blob-type PageBlob
```

b. Replace *local-path-to-vhd-file* with the location of the agent's `.vhd` file on your local machine.

c. Replace *sas-uri* with the SAS URI that you got when you ran the `az disk grant-access` command.

d. Run the command.

6. When the agent upload finishes, revoke access to your managed disk. To do this, copy the following Azure CLI command:

```
az disk revoke-access -n your-managed-disk -g your-resource-group
```

a. Replace *your-resource-group* with the name of the Azure resource group that your storage account belongs to.

b. Replace *your-managed-disk* with the name of the managed disk that you created.

c. Run the command.

7. Do the following to attach your managed disk to a new Linux VM:

a. Copy the following Azure CLI command:

```
az vm create --resource-group your-resource-group `
--location eastus `
```

```
--name your-agent-vm `
--size Standard_E4as_v4 `
--os-type linux `
--attach-os-disk your-managed-disk
```

b. Replace *your-resource-group* with the name of the Azure resource group that your storage account belongs to.

c. Replace *your-agent-vm* with a name for the VM that you can remember.

d. Replace *your-managed-disk* with the name of the managed disk that you're attaching to the VM.

e. Run the command.

You've deployed your agent. Before you can start configuring your data transfer, you must activate the agent.

Getting your agent's activation key

To manually get your DataSync agent's activation key, follow these steps.

Alternatively, DataSync can automatically get the activation key for you, but this approach requires some network configuration.

To get your agent's activation key

1. In the Azure portal, enable boot diagnostics for the VM for your agent by choosing the **Enable with custom storage account** setting and specifying your Azure storage account.

   After you've enabled the boot diagnostics for your agent's VM, you can access your agent's local console to get the activation key.
2. While still in the Azure portal, go to your VM and choose **Serial console**.
3. In the agent's local console, log in by using the following default credentials:

   - **Username** – **`admin`**
   - **Password** – **`password`**

   We recommend at some point changing at least the agent's password. In the agent's local console, enter **5** on the main menu, then use the `passwd` command to change the password.
4. Enter **`0`** to get the agent's activation key.

5. Enter the AWS Region where you're using DataSync (for example, **`us-east-1`**).
6. Choose the service endpoint that the agent will use to connect with AWS.
7. Save the value of the `Activation key` output.

Activating your agent

After you have the activation key, you can finish creating your DataSync agent.

To activate your agent

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**, and then choose **Create agent**.
3. For **Hypervisor**, choose **Microsoft Hyper-V**.
4. For **Endpoint type**, choose the same type of service endpoint that you specified when you got your agent's activation key (for example, choose **Public service endpoints in *`Region name`***).
5. Configure your network to work with the service endpoint type that your agent is using. For service endpoint network requirements, see the following topics:
   - VPC endpoints
   - Public endpoints
   - Federal Information Processing Standard (FIPS) endpoints
6. For **Activation key**, do the following:
   a. Choose **Manually enter your agent's activation key**.
   b. Enter the activation key that you got from the agent's local console.
7. Choose **Create agent**.

Your agent is ready to connect with your Azure Blob Storage. For more information, see Creating your Azure Blob Storage transfer location.

Amazon EC2 agents

You can deploy your DataSync agent on an Amazon EC2 instance.

To create an Amazon EC2 agent

1. Deploy an Amazon EC2 agent.

2. Choose a service endpoint that the agent uses to communicate with AWS.

   In this situation, we recommend using a virtual private cloud (VPC) service endpoint.
3. Configure your network to work with VPC service endpoints.
4. Activate the agent.

Creating your Azure Blob Storage transfer location

You can configure DataSync to use your Azure Blob Storage as a transfer source or destination.

Before you begin

Make sure that you know how DataSync accesses Azure Blob Storage and works with access tiers and blob types. You also need a DataSync agent that can connect to your Azure Blob Storage container.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Microsoft Azure Blob Storage**.
4. For **Container URL**, enter the URL of the container that's involved in your transfer.
5. (Optional) For **Access tier when used as a destination**, choose the access tier that you want your objects or files transferred into.
6. For **Folder**, enter path segments if you want to limit your transfer to a virtual directory in your container (for example, `/my/images`).
7. If your transfer requires an agent, choose **Use agents**, then choose the DataSync agent that can connect with your Azure Blob Storage container.
8. For **SAS token**, provide the credentials necessary for DataSync to access your blob storage. Some public datasets on Azure Blob storage do not require credentials. You can enter a SAS token directly, or specify an AWS Secrets Manager secret that contains the token. For more information, see Providing credentials for storage locations.

   Your SAS token is part of the SAS URI string that comes after your storage resource URI and a question mark (?). A token looks something like this:

```
sp=r&st=2023-12-20T14:54:52Z&se=2023-12-20T22:54:52Z&spr=https&sv=2021-06-08&sr=c&sig=aBBKD
%2FXTI9E%2F%2Fmq171%2BZU178wcwqU%3D
```

9. (Optional) Enter values for the **Key** and **Value** fields to tag the location.

   Tags help you manage, filter, and search for your AWS resources. We recommend creating at least a name tag for your location.

10. Choose **Create location**.

Using the AWS CLI

1. Copy the following `create-location-azure-blob` command:

```
aws datasync create-location-azure-blob \
  --container-url "https://path/to/container" \
  --authentication-type "SAS" \
  --sas-configuration '{
      "Token": "your-sas-token"
    }' \
  --agent-arns my-datasync-agent-arn \
  --subdirectory "/path/to/my/data" \
  --access-tier "access-tier-for-destination" \
  --tags [{"Key": "key1","Value": "value1"}]
```

2. For the `--container-url` parameter, specify the URL of the Azure Blob Storage container that's involved in your transfer.
3. For the `--authentication-type` parameter, specify SAS. If you are accessing a public dataset that does not require authentication, specify `NONE`.
4. For the `--sas-configuration` parameter's `Token` option, specify the SAS token that allows DataSync to access your blob storage.

   You can also provide additional parameters for securing your keys using AWS Secrets Manager. For more information, see Providing credentials for storage locations.

   Your SAS token is part of the SAS URI string that comes after your storage resource URI and a question mark (?). A token looks something like this:

```
sp=r&st=2023-12-20T14:54:52Z&se=2023-12-20T22:54:52Z&spr=https&sv=2021-06-08&sr=c&sig=aBBKD
%2FXTI9E%2F%2Fmq171%2BZU178wcwqU%3D
```

5. (Optional) For the `--agent-arns` parameter, specify the Amazon Resource Name (ARN) of the DataSync agent that can connect to your container.

   Here's an example agent ARN: `arn:aws:datasync:`*`us-east-1`*`:`*`123456789012`*`:agent/agent-`*`01234567890aaabfb`*

   You can specify more than one agent. For more information, see Using multiple DataSync agents.
6. For the `--subdirectory` parameter, specify path segments if you want to limit your transfer to a virtual directory in your container (for example, `/my/images`).
7. (Optional) For the `--access-tier` parameter, specify the access tier (`HOT`, `COOL`, or `ARCHIVE`) that you want your objects or files transferred into.

   This parameter applies only when you're using this location as a transfer destination.
8. (Optional) For the `--tags` parameter, specify key-value pairs that can help you manage, filter, and search for your location.

   We recommend creating a name tag for your location.
9. Run the `create-location-azure-blob` command.

   If the command is successful, you get a response that shows you the ARN of the location that you created. For example:

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh"
}
```

Viewing your Azure Blob Storage transfer location

You can get details about the existing DataSync transfer location for your Azure Blob Storage.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose your Azure Blob Storage location.

   You can see details about your location, including any DataSync transfer tasks that are using it.

Using the AWS CLI

1. Copy the following `describe-location-azure-blob` command:

```
aws datasync describe-location-azure-blob \
  --location-arn "your-azure-blob-location-arn"
```

2. For the `--location-arn` parameter, specify the ARN for the Azure Blob Storage location that you created (for example, `arn:aws:datasync:us-east-1:123456789012:location/loc-12345678abcdefgh`).
3. Run the `describe-location-azure-blob` command.

   You get a response that shows you details about your location. For example:

```
{
    "LocationArn": "arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh",
    "LocationUri": "azure-blob://my-user.blob.core.windows.net/container-1",
    "AuthenticationType": "SAS",
    "Subdirectory": "/my/images",
    "AgentArns": ["arn:aws:datasync:us-east-1:123456789012:agent/
agent-01234567890deadfb"],
}
```

Updating your Azure Blob Storage transfer location

If needed, you can modify your location's configuration in the console or by using the AWS CLI.

Using the AWS CLI

1. Copy the following `update-location-azure-blob` command:

```
aws datasync update-location-azure-blob \
  --location-arn "your-azure-blob-location-arn" \
  --authentication-type "SAS" \
```

```
  --sas-configuration '{
      "Token": "your-sas-token"
    }' \
  --agent-arns my-datasync-agent-arn \
  --subdirectory "/path/to/my/data" \
  --access-tier "access-tier-for-destination"
```

2. For the `--location-arn` parameter, specify the ARN for the Azure Blob Storage location that you're updating (for example, `arn:aws:datasync:us-east-1:123456789012:location/loc-12345678abcdefgh`).
3. For the `--authentication-type` parameter, specify SAS.
4. For the `--sas-configuration` parameter's `Token` option, specify the SAS token that allows DataSync to access your blob storage.

   The token is part of the SAS URI string that comes after the storage resource URI and a question mark (?). A token looks something like this:

   ```
   sp=r&st=2022-12-20T14:54:52Z&se=2022-12-20T22:54:52Z&spr=https&sv=2021-06-08&sr=c&sig=qCBKD
   %2FXTI9E%2F%2Fmq171%2BZU178wcwqU%3D
   ```

5. For the `--agent-arns` parameter, specify the Amazon Resource Name (ARN) of the DataSync agent that you want to connect to your container.

   Here's an example agent ARN: `arn:aws:datasync:us-east-1:123456789012:agent/agent-01234567890aaabfb`

   You can specify more than one agent. For more information, see Using multiple DataSync agents.
6. For the `--subdirectory` parameter, specify path segments if you want to limit your transfer to a virtual directory in your container (for example, `/my/images`).
7. (Optional) For the `--access-tier` parameter, specify the access tier (`HOT`, `COOL`, or `ARCHIVE`) that you want your objects to be transferred into.

   This parameter applies only when you're using this location as a transfer destination.

Next steps

After you finish creating a DataSync location for your Azure Blob Storage, you can continue setting up your transfer. Here are some next steps to consider:

1. If you haven't already, create another location where you plan to transfer your data to or from your Azure Blob Storage.
2. Learn how DataSync handles metadata and special files, particularly if your transfer locations don't have a similar metadata structure.
3. Configure how your data gets transferred. For example, you can transfer only a subset of your data or delete files in your blob storage that aren't in your source location (as long as your SAS token has delete permissions).
4. Start your transfer.

Configuring AWS DataSync transfers with Microsoft Azure Files SMB shares

You can configure AWS DataSync to transfer data to or from a Microsoft Azure Files Server Message Block (SMB) share.

> **Tip**
>
> For a full walkthrough on moving data from Azure Files SMB shares to AWS, see the AWS Storage Blog.

Providing DataSync access to SMB shares

DataSync connects to your SMB share using the SMB protocol and authenticates with credentials that you provide it.

Topics

- Supported SMB protocol versions
- Required permissions

Supported SMB protocol versions

By default, DataSync automatically chooses a version of the SMB protocol based on negotiation with your SMB file server.

You also can configure DataSync to use a specific SMB version, but we recommend doing this only if DataSync has trouble negotiating with the SMB file server automatically. DataSync supports

SMB versions 1.0 and later. For security reasons, we recommend using SMB version 3.0.2 or later. Earlier versions, such as SMB 1.0, contain known security vulnerabilities that attackers can exploit to compromise your data.

See the following table for a list of options in the DataSync console and API:

Console option	API option	Description
Automatic	`AUTOMATIC`	DataSync and the SMB file server negotiate the highest version of SMB that they mutually support between 2.1 and 3.1.1. This is the default and recommended option. If you instead choose a specific version that your file server doesn't support, you may get an `Operation Not Supported` error.
SMB 3.0.2	`SMB3`	Restricts the protocol negotiation to only SMB version 3.0.2.
SMB 2.1	`SMB2`	Restricts the protocol negotiation to only SMB version 2.1.
SMB 2.0	`SMB2_0`	Restricts the protocol negotiation to only SMB version 2.0.
SMB 1.0	`SMB1`	Restricts the protocol negotiation to only SMB version 1.0.

Required permissions

DataSync needs a user who has permission to mount and access your SMB location. This can be a local user on your Windows file server or a domain user that's defined in your Microsoft Active Directory.

To set object ownership, DataSync requires the `SE_RESTORE_NAME` privilege, which is usually granted to members of the built-in Active Directory groups **Backup Operators** and **Domain Admins**. Providing a user to DataSync with this privilege also helps ensure sufficient permissions to files, folders, and file metadata, except for NTFS system access control lists (SACLs).

Additional privileges are required to copy SACLs. Specifically, this requires the Windows `SE_SECURITY_NAME` privilege, which is granted to members of the **Domain Admins** group. If you configure your task to copy SACLs, make sure that the user has the required privileges. To learn more about configuring a task to copy SACLs, see Configuring how to handle files, objects, and metadata.

When you copy data between an SMB file server and Amazon FSx for Windows File Server file system, the source and destination locations must belong to the same Microsoft Active Directory domain or have an Active Directory trust relationship between their domains.

Creating your Azure Files transfer location by using the console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Server Message Block (SMB)**.

   You configure this location as a source or destination later.
4. For **Agents**, choose one or more DataSync agents that you want to connect to your SMB share.

   If you choose more than one agent, make sure you understand using multiple agents for a location.
5. For **SMB Server**, enter the Domain Name System (DNS) name or IP address of the SMB share that your DataSync agent will mount.

   > **Note**
   >
   > You can't specify an IP version 6 (IPv6) address.

6. For **Share name**, enter the name of the share exported by your SMB share where DataSync will read or write data.

   You can include a subdirectory in the share path (for example, `/path/to/subdirectory`). Make sure that other SMB clients in your network can also mount this path.

   To copy all the data in the subdirectory, DataSync must be able to mount the SMB share and access all of its data. For more information, see Required permissions.
7. (Optional) Expand **Additional settings** and choose an **SMB Version** for DataSync to use when accessing your SMB share.

By default, DataSync automatically chooses a version based on negotiation with the SMB share. For information, see Supported SMB versions.

8. For **User**, enter a user name that can mount your SMB share and has permission to access the files and folders involved in your transfer.

   For more information, see Required permissions.

9. For **Password**, enter the password of the user who can mount your SMB share and has permission to access the files and folders involved in your transfer.

10. (Optional) For **Domain**, enter the Windows domain name that your SMB share belongs to.

    If you have multiple domains in your environment, configuring this setting makes sure that DataSync connects to the right share.

11. (Optional) Choose **Add tag** to tag your location.

    Tags are key-value pairs that help you manage, filter, and search for your locations. We recommend creating at least a name tag for your location.

12. Choose **Create location**.

Configuring transfers with other cloud object storage

With AWS DataSync, you can transfer data between AWS storage services and the following cloud object storage providers:

- Wasabi Cloud Storage
- DigitalOcean Spaces
- Oracle Cloud Infrastructure Object Storage
- Cloudflare R2 Storage
- Backblaze B2 Cloud Storage
- NAVER Cloud Object Storage
- Alibaba Cloud Object Storage Service
- IBM Cloud Object Storage
- Seagate Lyve Cloud

A DataSync agent is required only when transferring data between storage systems in other clouds and Amazon EFS or Amazon FSx, or when using **Basic** mode tasks. You don't need an agent to transfer data between storage systems in other clouds and Amazon S3 using **Enhanced** mode.

Regardless of whether you use an agent, you must also create a transfer location for your cloud object storage (specifically an **Object storage** location). DataSync can use this location as a source or destination for your transfer.

Providing DataSync access to your other cloud object storage

How DataSync accesses your cloud object storage depends on several factors, including whether your storage is compatible with the Amazon S3 API and the permissions and credentials that DataSync needs to access your storage.

Topics

- Amazon S3 API compatibility
- Storage permissions and endpoints
- Storage credentials

Amazon S3 API compatibility

Your cloud object storage must be compatible with the following Amazon S3 API operations for DataSync to connect to it:

- `AbortMultipartUpload`
- `CompleteMultipartUpload`
- `CopyObject`
- `CreateMultipartUpload`
- `DeleteObject`
- `DeleteObjects`
- `DeleteObjectTagging`
- `GetBucketLocation`
- `GetObject`
- `GetObjectTagging`

- `HeadBucket`
- `HeadObject`
- `ListObjectsV2`
- `PutObject`
- `PutObjectTagging`
- `UploadPart`

Storage permissions and endpoints

You must configure the permissions that allow DataSync to access your cloud object storage. If your object storage is a source location, DataSync needs read and list permissions for the bucket that you're transferring data from. If your object storage is a destination location, DataSync needs read, list, write, and delete permissions for the bucket.

DataSync also needs an endpoint (or server) to connect to your storage. The following table describes the endpoints that DataSync can use to access other cloud object storage:

Other cloud provider	Endpoint
Wasabi Cloud Storage	`S3.`*`region`*`.wasabisys.com`
DigitalOcean Spaces	*`region`*`.digitaloceanspaces.com`
Oracle Cloud Infrastructure Object Storage	*`namespace`* `.compat.objectstorage.` *`region`*`.oraclecloud.com`
Cloudflare R2 Storage	*`account-id`* `.r2.cloudflarestorage.com`
Backblaze B2 Cloud Storage	`S3.`*`region`*`.backblazeb2.com`
NAVER Cloud Object Storage	*`region`*`.object.ncloudstorage.com` (most regions)
Alibaba Cloud Object Storage Service	*`region`*`.aliyuncs.com`
IBM Cloud Object Storage	`s3.`*`region`*`.cloud-object-storage.appdomain.cloud`

Other cloud provider	Endpoint
Seagate Lyve Cloud	`s3.region.lyvecloud.seagate.com`

Important

For details on how to configure bucket permissions and updated information on storage endpoints, see your cloud provider's documentation.

Storage credentials

DataSync also needs the credentials to access the object storage bucket involved in your transfer. This might be an access key and secret key or something similar depending on how your cloud storage provider refers to these credentials.

For more information, see your cloud provider's documentation.

Considerations when transferring from other cloud object storage

When planning to transfer objects to or from another cloud storage provider by using DataSync, there are some things to keep in mind.

Topics

- Costs
- Storage classes
- Object tags
- Transferring to Amazon S3

Costs

The fees associated with moving data in and out of another cloud storage provider can include:

- Running an Amazon EC2 instance for your DataSync agent
- Transferring the data by using DataSync, including request charges related to your cloud object storage and Amazon S3 (if S3 is your transfer destination)
- Transferring data in or out of your cloud storage (check your cloud provider's pricing)

- Storing data in an AWS storage service supported by DataSync
- Storing data in another cloud provider (check your cloud provider's pricing)

Storage classes

Some cloud storage providers have storage classes (similar to Amazon S3) which DataSync can't read without being restored first. For example, Oracle Cloud Infrastructure Object Storage has an archive storage class. You need to restore objects in that storage class before DataSync can transfer them. For more information, see your cloud provider's documentation.

Object tags

Not all cloud providers support object tags. The ones that do might not allow querying tags through the Amazon S3 API. In either situation, your DataSync transfer task might fail if you try to copy object tags.

You can avoid this by clearing the **Copy object tags** checkbox in the DataSync console when creating, starting, or updating your task.

Transferring to Amazon S3

When transferring to Amazon S3, DataSync can't transfer objects larger than 5 TB. DataSync also can only copy object metadata up to 2 KB.

Creating your DataSync agent

A DataSync agent is required only when transferring data between storage systems in other clouds and Amazon EFS or Amazon FSx, or when using **Basic** mode tasks. You don't need an agent to transfer data between storage systems in other clouds and Amazon S3 using **Enhanced** mode. This section desribes how to deploy and activate an agent on an Amazon EC2 instance in your virtual private cloud (VPC) in AWS.

To create an Amazon EC2 agent

1. Deploy an Amazon EC2 agent.
2. Choose a service endpoint that the agent uses to communicate with AWS.

   In this situation, we recommend using a VPC service endpoint.
3. Configure your network to work with VPC service endpoints.

4. Activate the agent.

Creating a transfer location for your other cloud object storage

You can configure DataSync to use your cloud object storage as a source or destination location.

Before you begin

Make sure that you know how DataSync accesses your cloud object storage. You also need a DataSync agent that can connect to your cloud object storage.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations** and **Create location**.
3. For **Location type**, choose **Object storage**.
4. For **Server**, enter the endpoint that DataSync can use to access your cloud object storage:
   - **Wasabi Cloud Storage** – `S3.region.wasabisys.com`
   - **DigitalOcean Spaces** – `region.digitaloceanspaces.com`
   - **Oracle Cloud Infrastructure Object Storage** – `namespace.compat.objectstorage.region.oraclecloud.com`
   - **Cloudflare R2 Storage** – `account-id.r2.cloudflarestorage.com`
   - **Backblaze B2 Cloud Storage** – `S3.region.backblazeb2.com`
   - **NAVER Cloud Object Storage** – `region.object.ncloudstorage.com` (most regions)
   - **Alibaba Cloud Object Storage Service** – `region.aliyuncs.com`
   - **IBM Cloud Object Storage** – `s3.region.cloud-object-storage.appdomain.cloud`
   - **Seagate Lyve Cloud** – `s3.region.lyvecloud.seagate.com`
5. For **Bucket name**, enter the name of the object storage bucket that you're transferring data to or from.
6. For **Folder**, enter an object prefix. DataSync only transfers objects with this prefix.
7. If your transfer requires an agent, choose **Use agents**, then choose the DataSync agent that can connect with your cloud object storage.
8. Expand **Additional settings**. For **Server protocol**, choose **HTTPS**. For **Server port**, choose **443**.
9. Scroll down to the **Authentication** section. Make sure that the **Requires credentials** check box is selected, and then provide DataSync your storage credentials.

- For **Access key**, enter the ID to access your cloud object storage.
- For **Secret key**, provide the secret key to access your cloud object storage. You can either enter the key directly, or specify an AWS Secrets Manager secret that contains the key. For more information, see Providing credentials for storage locations.

10. (Optional) Enter values for the **Key** and **Value** fields to tag the location.

    Tags help you manage, filter, and search for your AWS resources. We recommend creating at least a name tag for your location.

11. Choose **Create location**.

Next steps

After you finish creating a DataSync location for your cloud object storage, you can continue setting up your transfer. Here are some next steps to consider:

1. If you haven't already, create another location where you plan to transfer your data to or from in AWS.
2. Learn how DataSync handles metadata and special files for object storage locations.
3. Configure how your data gets transferred. For example, maybe you only want to transfer a subset of your data.

   > **Important**
   >
   > Make sure that you configure how DataSync copies object tags correctly. For more information, see considerations with object tags.

4. Start your transfer.

Creating a task for transferring your data

A *task* describes where and how AWS DataSync transfers data. A task consists of the following:

- **Source location** – The storage system or service where DataSync transfers data from.
- **Destination location** – The storage system or service where DataSync transfers data to.

- **Task options** – Settings such as what files to transfer, how data gets verified, when the task runs, and more.
- **Task executions** – When you run a task, it's called a *task execution*.

Creating your task

When you create a DataSync task, you specify your source and destination locations. You also can customize your task by choosing which files to transfer, how metadata gets handled, setting up a schedule, and more.

Before you create your task, make sure that you understand how DataSync transfers work and review the task quotas.

> **Important**
>
> If you're planning to transfer data to or from an Amazon S3 location, review how DataSync can affect your S3 request charges and the DataSync pricing page before you begin.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. Make sure you're in one of the AWS Regions where you plan to transfer data.
3. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
4. On the **Configure source location** page, create or choose a source location, then choose **Next**.
5. On the **Configure destination location** page, create or choose a destination location, then choose **Next**.
6. (Recommended) On the **Configure settings** page, give your task a name that you can remember.
7. While still on the **Configure settings** page, choose your task options or use the default settings.

   You might be interested in some of the following options:

   - Specify the task mode that you want to use.

- Specify what data to transfer by using a manifest or filters.
- Configure how to handle file metadata and verify data integrity.
- Monitor your transfer with task reports or Amazon CloudWatch. We recommend setting up some kind of monitoring for your task.

When you're done, choose **Next**.

8. Review your task configuration, then choose **Create task**.

You're ready to start your task.

Using the AWS CLI

Once you create your DataSync source and destination locations, you can create your task.

1. In your AWS CLI settings, make sure that you're using one of the AWS Regions where you plan to transfer data.
2. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --destination-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --name "task-name"
```

3. For `--source-location-arn`, specify the Amazon Resource Name (ARN) of your source location.
4. For `--destination-location-arn`, specify the ARN of your destination location.

   If you're transferring across AWS Regions or accounts, make sure that the ARN includes the other Region or account ID.
5. (Recommended) For `--name`, specify a name for your task that you can remember.
6. Specify other task options as needed. You might be interested in some of the following options:

   - Specify what data to transfer by using a manifest or filters.
   - Configure how to handle file metadata and verify data integrity.

- Monitor your transfer with task reports or Amazon CloudWatch. We recommend setting up some kind of monitoring for your task.

For more options, see create-task. Here's an example `create-task` command that specifies several options:

```
aws datasync create-task \
  --source-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --destination-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --cloud-watch-log-group-arn "arn:aws:logs:region:account-id" \
  --name "task-name" \
  --options
 VerifyMode=NONE,OverwriteMode=NEVER,Atime=BEST_EFFORT,Mtime=PRESERVE,Uid=INT_VALUE,Gid=INT
```

7. Run the `create-task` command.

If the command is successful, you get a response that shows you the ARN of the task that you created. For example:

```
{
    "TaskArn": "arn:aws:datasync:us-east-1:111222333444:task/
task-08de6e6697796f026"
}
```

You're ready to start your task.

Task statuses

When you create a DataSync task, you can check its status to see if it's ready to run.

Console status	API status	Description
Available	`AVAILABLE`	The task is ready to start transferring data.
Running	`RUNNING`	A task execution is in progress. For more information, see Task execution statuses.

Console status	API status	Description
Unavailable	`UNAVAILABLE`	A DataSync agent used by the task is offline. For more information, see What do I do if my agent is offline?
Queued	`QUEUED`	Another task execution that uses the same DataSync agent is in progress. For more information, see Knowing when your task is queued.

Partitioning large datasets with multiple tasks

If you're transferring a large dataset, such as migrating millions of files or objects, we recommend using DataSync Enhanced mode for your transfer, which can transfer datasets with virtually unlimited numbers of files. For very large datasets, with billions of files, you should consider partitioning your dataset with multiple DataSync tasks. Partitioning your data across multiple tasks (and possibly agents, depending on your locations) helps reduce the time it takes DataSync to prepare and transfer your data.

Consider some of the ways that you can partition a large dataset across several DataSync tasks:

- Create tasks that transfer separate folders. For example, you might create two tasks that target `/FolderA` and `/FolderB`, respectively, in your source storage.
- Create tasks that transfer subsets of files, objects, and folders by using a manifest or filters.

Be mindful that this approach can increase the I/O operations on your storage and affect your network bandwidth. For more information, see the blog on How to accelerate your data transfers with DataSync scale out architectures.

Segmenting transferred data with multiple tasks

If you're transferring different sets of data to the same destination, you can create multiple tasks to help segment the data that you transfer.

For example, if you're transferring to the same S3 bucket named `MyBucket`, you can create different prefixes in the bucket that correspond to each task. This approach prevents file name conflicts the datasets and allows you to set different permissions for each prefix. Here's how you might set this up:

1. Create three prefixes in the destination `MyBucket` named `task1`, `task2`, and `task3`:
   - `s3://MyBucket/task1`
   - `s3://MyBucket/task2`
   - `s3://MyBucket/task3`
2. Create three DataSync tasks named `task1`, `task2`, and `task3` that transfer to the corresponding prefix in `MyBucket`.

Choosing a task mode for your data transfer

Your AWS DataSync task can run in one of the following modes:

- **Enhanced mode** – Transfer virtually unlimited numbers of files or objects with higher performance than Basic mode. Enhanced mode tasks optimize the data transfer process by listing, preparing, transferring, and verifying data in parallel. Enhanced mode is currently available for transfers between Amazon S3 locations, transfers between Azure Blob and Amazon S3 without an agent, transfers between other clouds and Amazon S3 without an agent, and transfers between NFS or SMB file servers and Amazon S3 using an Enhanced mode agent.
- **Basic mode** – Transfer files or objects between AWS storage and all other supported DataSync locations. Basic mode tasks are subject to quotas on the number of files, objects, and directories in a dataset. Basic mode sequentially prepares, transfers, and verifies data, making it slower than Enhanced mode for most workloads.

Understanding task mode differences

The following information can help you determine which task mode to use.

Capability	Enhanced mode behavior	Basic mode behavior
Performance	DataSync lists, prepares, transfers, and verifies your data in parallel. Provides higher performance than Basic mode for most workloads (such as transferring large objects)	DataSync prepares, transfers, and verifies your data sequentially. Performance is slower than Enhanced mode for most workloads

Capability	Enhanced mode behavior	Basic mode behavior
Number of items in a dataset that DataSync can work with per task execution	Virtually unlimited numbers of objects	Quotas apply
Data transfer counters and metrics	More counters and metrics than Basic mode, such as the number of objects that DataSync finds at your source location, how many objects are prepared during each task execution, and folder counters similar to file and object counters	Less counters and metrics than Enhanced mode
Logging	Structured logs (JSON format)	Unstructured logs
Supported locations	Currently for transfers between Amazon S3 locations , transfers between Azure Blob and Amazon S3 without an agent, transfers between other clouds and Amazon S3 without an agent, and transfers between NFS or SMB file servers and Amazon S3 using an Enhanced mode agent.	For transfers between all locations that DataSync supports
Data verification options	DataSync verifies only transferred data	DataSync verifies all data by default
Cost	For more information, see the DataSync pricing page	For more information, see the DataSync pricing page

Capability	Enhanced mode behavior	Basic mode behavior
Failure handling for unsupported object tags	For cloud storage transfers to or from locations that don't support object tagging, task execution will fail immediately if the `ObjectTags` option is unspeficied or set to `PRESERVE`.	For cloud storage transfers to or from locations that don't support object tagging, task execution will run normally, but will report per-object failures for tagged objects if the `ObjectTags` option is unspecified or set to `PRESERVE`.

Choosing a task mode

You can choose Enhanced mode only for transfers between Amazon S3 locations, transfers between Azure Blob and Amazon S3 without an agent, transfers between other clouds and Amazon S3 without an agent, and transfers between NFS or SMB file servers and Amazon S3 using an Enhanced mode agent. Otherwise, you must use Basic mode. For example, a transfer from an on-premises HDFS location to an S3 location requires Basic mode.

Your task options and performance might vary depending on the task mode you choose. Once you create your task, you can't change the task mode.

Required permissions

To create an Enhanced mode task, the IAM role that you're using DataSync with must have the `iam:CreateServiceLinkedRole` permission.

For your DataSync user permissions, consider using AWSDataSyncFullAccess. This is an AWS managed policy that provides a user full access to DataSync and minimal access to its dependencies.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.

3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?

4. For **Task mode**, choose one of the following options:

   - **Enhanced**
   - **Basic**

   For more information, see Understanding task mode differences.

5. While still on the **Configure settings** page, choose other task options or use the default settings.

   You might be interested in some of the following options:

   - Specify what data to transfer by using a manifest or filters.
   - Configure how to handle file metadata and verify data integrity.
   - Monitor your transfer with task reports or Amazon CloudWatch Logs.

   When you're done, choose **Next**.

6. Review your task configuration, then choose **Create task**.

Using the AWS CLI

1. In your AWS CLI settings, make sure that you're using one of the AWS Regions where you plan to transfer data.
2. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --destination-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --task-mode "ENHANCED-or-BASIC"
```

3. For `--source-location-arn`, specify the Amazon Resource Name (ARN) of your source location.
4. For `--destination-location-arn`, specify the ARN of your destination location.

If you're transferring across AWS Regions or accounts, make sure that the ARN includes the other Region or account ID.

5. For `--task-mode`, specify `ENHANCED` or `BASIC`.

   For more information, see Understanding task mode differences.

6. Specify other task options as needed. You might be interested in some of the following options:

   - Specify what data to transfer by using a manifest or filters.
   - Configure how to handle file metadata and verify data integrity.
   - Monitor your transfer with task reports or Amazon CloudWatch Logs.

   For more options, see create-task. Here's an example `create-task` command that specifies Enhanced mode and several other options:

```
aws datasync create-task \
  --source-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-
id" \
  --destination-location-arn "arn:aws:datasync:us-east-1:account-
id:location/location-id" \
  --name "task-name" \
  --task-mode "ENHANCED" \
  --options
 TransferMode=CHANGED,VerifyMode=ONLY_FILES_TRANSFERRED,ObjectTags=PRESERVE,LogLevel=TRANSF
```

7. Run the `create-task` command.

   If the command is successful, you get a response that shows you the ARN of the task that you created. For example:

```
{
    "TaskArn": "arn:aws:datasync:us-east-1:111222333444:task/
task-08de6e6697796f026"
}
```

Using the DataSync API

You can specify the DataSync task mode by configuring the `TaskMode` parameter in the CreateTask operation.

Choosing what AWS DataSync transfers

AWS DataSync lets you choose what to transfer and how you want your data handled. Some options include:

- Transferring an exact list of files or object by using a manifest.
- Including or excluding certain types of data in your transfer by using a filter.
- For recurring transfers, moving only the data that's changed since the last transfer
- Overwriting data in the destination location to match what's in the source location.
- Choosing which file or object metadata to preserve between your storage locations.

Topics

Transferring specific files or objects by using a manifest

A *manifest* is a list of files or objects that you want AWS DataSync to transfer. For example, instead of having to transfer everything in an S3 bucket with potentially millions of objects, DataSync transfers only the objects that you list in your manifest.

Manifests are similar to filters but let you identify exactly which files or objects to transfer instead of data that matches a filter pattern.

> **Note**
>
> The maximum allowable size for a manifest file with Enhanced mode tasks is 20 GB.

Creating your manifest

A manifest is a comma-separated values (CSV)-formatted file that lists the files or objects in your source location that you want DataSync to transfer. If your source is an S3 bucket, you can also include which version of an object to transfer.

Topics

- Guidelines
- Example manifests

Guidelines

Use these guidelines to help you create a manifest that works with DataSync.

Do

- Specify the full path of each file or object that you want to transfer.

  You can't specify only a directory or folder with the intention of transferring all of its contents. For these situations, consider using an include filter instead of a manifest.
- Make sure that each file or object path is relative to the mount path, folder, directory, or prefix that you specified when configuring your DataSync source location.

  For example, let's say you configure an S3 location with a prefix named `photos`. That prefix includes an object `my-picture.png` that you want to transfer. In the manifest, you then only need to specify the object (`my-picture.png`) instead of the prefix and object (`photos/my-picture.png`).
- To specify Amazon S3 object version IDs, separate the object's path and version ID by using a comma.

  The following example shows a manifest entry with two fields. The first field includes an object named `picture1.png`. The second field is separated by a comma and includes a version ID of `111111`:

  ```
  picture1.png,111111
  ```
- Use quotes in the following situations:
  - When a path contains special characters (commas, quotes, and line endings):

`"filename,with,commas.txt"`

- When a path spans multiple lines:

```
"this
is
a
filename.txt"
```

- When a path includes quotes:

  `filename""with""quotes.txt`

  This represents a path named `filename"with"quotes.txt`.

These quote rules also apply to version ID fields. In general, if a manifest field has a quote, you must escape it with another quote.

- Separate each file or object entry with a new line.

  You can separate lines by using Linux (line feed or carriage return) or Windows (carriage return followed by a line feed) style line breaks.
- Save your manifest (for example, `my-manifest.csv` or `my-manifest.txt`).
- Upload the manifest to an S3 bucket that DataSync can access.

  This bucket doesn't have to be in the same AWS Region or account where you're using DataSync.

Don't

- Specify only a directory or folder with the intention of transferring all of its contents.

  A manifest can only include full paths to the files or objects that you want to transfer. If you configure your source location to use a specific mount path, folder, directory, or prefix, you don't have to include that in your manifest.
- Specify a file or object path that exceeds 4,096 characters.
- Specify a file path, object path, or Amazon S3 object version ID that exceeds 1,024 bytes.
- Specify duplicate file or object paths.
- Include an object version ID if your source location isn't an S3 bucket.

- Include more than two fields in a manifest entry.

  An entry can include only a file or object path and (if applicable) an Amazon S3 object version ID.
- Include characters that don't conform to UTF-8 encoding.
- Include unintentional spaces in your entry fields outside of quotes.

Example manifests

Use these examples to help you create a manifest that works with DataSync.

Manifest with full file or object paths

The following example shows a manifest with full file or object paths to transfer.

```
photos/picture1.png
photos/picture2.png
photos/picture3.png
```

Manifest with only object keys

The following example shows a manifest with objects to transfer from an Amazon S3 source location. Since the location is configured with the prefix `photos`, only the object keys are specified.

```
picture1.png
picture2.png
picture3.png
```

Manifest with object paths and version IDs

The first two entries in the following manifest example include specific Amazon S3 object versions to transfer.

```
photos/picture1.png,111111
photos/picture2.png,121212
photos/picture3.png
```

Manifest with UTF-8 characters

The following example shows a manifest with files that include UTF-8 characters.

```
documents/résumé1.pdf
documents/résumé2.pdf
documents/résumé3.pdf
```

Providing DataSync access to your manifest

You need an AWS Identity and Access Management (IAM) role that gives DataSync access to your manifest in its S3 bucket. This role must include the following permissions:

- `s3:GetObject`
- `s3:GetObjectVersion`

You can generate this role automatically in the DataSync console or create the role yourself.

> **Note**
>
> If your manifest is in a different AWS account, you must create this role manually.

Creating the IAM role automatically

When creating or starting a transfer task in the console, DataSync can create an IAM role for you with the `s3:GetObject` and `s3:GetObjectVersion` permissions that you need to access your manifest.

Required permissions to automatically create the role

To automatically create the role, make sure that the role that you're using to access the DataSync console has the following permissions:

- `iam:CreateRole`
- `iam:CreatePolicy`
- `iam:AttachRolePolicy`

Creating the IAM role (same account)

You can manually create the IAM role that DataSync needs to access your manifest. The following instructions assume that you're in the same AWS account where you use DataSync and your manifest's S3 bucket is located.

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
3. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.
4. For **Use case**, choose **DataSync** in the dropdown list and select **DataSync**. Choose **Next**.
5. On the **Add permissions** page, choose **Next**. Give your role a name and choose **Create role**.
6. On the **Roles** page, search for the role that you just created and choose its name.
7. On the role's details page, choose the **Permissions** tab. Choose **Add permissions** then **Create inline policy**.
8. Choose the **JSON** tab and paste the following sample policy into the policy editor:

```
{
    "Version": "2012-10-17",
    "Statement": [{
        "Sid": "DataSyncAccessManifest",
        "Effect": "Allow",
        "Action": [
            "s3:GetObject",
            "s3:GetObjectVersion"
        ],
        "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/my-manifest.csv"
    }]
}
```

9. In the sample policy that you just pasted, replace the following values with your own:
    a. Replace *amzn-s3-demo-bucket* with the name of the S3 bucket that's hosting your manifest.
    b. Replace *my-manifest.csv* with the file name of your manifest.
10. Choose **Next**. Give your policy a name and choose **Create policy**.
11. (Recommended) To prevent the cross-service confused deputy problem, do the following:

a. On the role's details page, choose the **Trust relationships** tab. Choose **Edit trust policy**.

b. Update the trust policy by using the following example, which includes the `aws:SourceArn` and `aws:SourceAccount` global condition context keys:

```
{
    "Version": "2012-10-17",
    "Statement": [
      {
        "Effect": "Allow",
        "Principal": {
            "Service": "datasync.amazonaws.com"
        },
        "Action": "sts:AssumeRole",
        "Condition": {
            "StringEquals": {
            "aws:SourceAccount": "555555555555"
            },
            "ArnLike": {
            "aws:SourceArn": "arn:aws:datasync:us-east-1:555555555555:*"
            }
        }
      }
  ]
}
```

- Replace each instance *`account-id`* with the AWS account ID where you're using DataSync.
- Replace *`region`* with the AWS Region where you're using DataSync.

c. Choose **Update policy**.

You've created an IAM role that allows DataSync to access your manifest. Specify this role when creating or starting your task.

Creating the IAM role (different account)

If your manifest is in an S3 bucket that belongs to a different AWS account, you must manually create the IAM role that DataSync uses to access the manifest. Then, in the AWS account where your manifest is located, you need to include the role in the S3 bucket policy.

Creating the role

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
3. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.
4. For **Use case**, choose **DataSync** in the dropdown list and select **DataSync**. Choose **Next**.
5. On the **Add permissions** page, choose **Next**. Give your role a name and choose **Create role**.
6. On the **Roles** page, search for the role that you just created and choose its name.
7. On the role's details page, choose the **Permissions** tab. Choose **Add permissions** then **Create inline policy**.
8. Choose the **JSON** tab and paste the following sample policy into the policy editor:

```
{
    "Version": "2012-10-17",
    "Statement": [{
        "Sid": "DataSyncAccessManifest",
        "Effect": "Allow",
        "Action": [
            "s3:GetObject",
            "s3:GetObjectVersion"
        ],
        "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/my-manifest.csv"
    }]
}
```

9. In the sample policy that you just pasted, replace the following values with your own:
    a. Replace *amzn-s3-demo-bucket* with the name of the S3 bucket that's hosting your manifest.
    b. Replace *my-manifest.csv* with the file name of your manifest.
10. Choose **Next**. Give your policy a name and choose **Create policy**.
11. (Recommended) To prevent the cross-service confused deputy problem, do the following:
    a. On the role's details page, choose the **Trust relationships** tab. Choose **Edit trust policy**.
    b. Update the trust policy by using the following example, which includes the `aws:SourceArn` and `aws:SourceAccount` global condition context keys:

```
{
    "Version": "2012-10-17",
    "Statement": [
      {
        "Effect": "Allow",
        "Principal": {
            "Service": "datasync.amazonaws.com"
        },
        "Action": "sts:AssumeRole",
        "Condition": {
            "StringEquals": {
            "aws:SourceAccount": "000000000000"
            },
            "ArnLike": {
            "aws:SourceArn": "arn:aws:datasync:us-east-1:000000000000:*"
            }
        }
     }
  ]
}
```

- Replace each instance of *account-id* with the AWS account ID where you're using DataSync.
- Replace *region* with the AWS Region where you're using DataSync.

c. Choose **Update policy**.

You created the IAM role that you can include in your S3 bucket policy.

Updating your S3 bucket policy with the role

Once you've created the IAM role, you must add it to the S3 bucket policy in the other AWS account where your manifest is located.

1. In the AWS Management Console, switch over to the account with your manfiest's S3 bucket.
2. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
3. On the bucket's detail page, choose the **Permissions** tab.
4. Under **Bucket policy**, choose **Edit** and do the following to modify your S3 bucket policy:

   a. Update what's in the editor to include the following policy statements:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "DataSyncAccessManifestBucket",
      "Effect": "Allow",
      "Action": [
        "s3:GetObject",
        "s3:GetObjectVersion"
      ],
      "Resource": "arn:aws:s3:::amzn-s3-demo-bucket"
    }
  ]
}
```

b. Replace *account-id* with the AWS account ID for the account that you're using DataSync with.

c. Replace *datasync-role* with the IAM role that you just created that allows DataSync to access your manifest.

d. Replace *amzn-s3-demo-bucket* with the name of the S3 bucket that's hosting your manifest in the other AWS account.

5. Choose **Save changes**.

You've created an IAM role that allows DataSync to access your manifest in the other account. Specify this role when creating or starting your task.

Specifying your manifest when creating a task

You can specify the manifest that you want DataSync to use when creating a task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For **Contents to scan**, choose **Specific files, objects, and folders**, then select **Using a manifest**.

5. For **S3 URI**, choose your manifest that's hosted on an S3 bucket.

   Alternatively, you can enter the URI (for example, `s3://bucket/prefix/my-manifest.csv`).

6. For **Object version**, choose the version of the manifest that you want DataSync to use.

   By default, DataSync uses the latest version of the object.

7. For **Manifest access role**, do one of the following:

   - Choose **Autogenerate** for DataSync to automatically create an IAM role with the permissions required to access your manifest in its S3 bucket.
   - Choose an existing IAM role that can access your manifest.

   For more information, see Providing DataSync access to your manifest.

8. Configure any other task settings you need, then choose **Next**.
9. Choose **Create task**.

Using the AWS CLI

1. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh \
  --destination-location-arn arn:aws:datasync:us-east-1:123456789012:location/loc-
abcdefgh12345678 \
  --manifest-config {
      "Source": {
        "S3": {
            "ManifestObjectPath": "s3-object-key-of-manifest",
            "BucketAccessRoleArn": "bucket-iam-role",
            "S3BucketArn": "amzn-s3-demo-bucket-arn",
            "ManifestObjectVersionId": "manifest-version-to-use"
        }
      }
  }
```

2. For the `--source-location-arn` parameter, specify the Amazon Resource Name (ARN) of the location that you're transferring data from.

3. For the `--destination-location-arn` parameter, specify the ARN of the location that you're transferring data to.
4. For the `--manifest-config` parameter, do the following:

   - `ManifestObjectPath` – Specify the S3 object key of your manifest.
   - `BucketAccessRoleArn` – Specify the IAM role that allows DataSync to access your manifest in its S3 bucket.

     For more information, see Providing DataSync access to your manifest.

   - `S3BucketArn` – Specify the ARN of the S3 bucket that's hosting your manifest.
   - `ManifestObjectVersionId` – Specify the version of the manifest that you want DataSync to use.

     By default, DataSync uses the latest version of the object.
5. Run the `create-task` command to create your task.

When you're ready, you can start your transfer task.

Specifying your manifest when starting a task

You can specify the manifest that you want DataSync to use when executing a task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Tasks**, and then choose the task that you want to start.
3. In the task overview page, choose **Start**, and then choose **Start with overriding options**.
4. For **Contents to scan**, choose **Specific files, objects, and folders**, then select **Using a manifest**.
5. For **S3 URI**, choose your manifest that's hosted on an S3 bucket.

   Alternatively, you can enter the URI (for example, `s3://bucket/prefix/my-manifest.csv`).
6. For **Object version**, choose the version of the manifest that you want DataSync to use.

   By default, DataSync uses the latest version of the object.
7. For **Manifest access role**, do one of the following:

- Choose **Autogenerate** for DataSync to automatically create an IAM role to access your manifest in its S3 bucket.
- Choose an existing IAM role that can access your manifest.

For more information, see Providing DataSync access to your manifest.

8. Choose **Start** to begin your transfer.

Using the AWS CLI

1. Copy the following `start-task-execution` command:

```
aws datasync start-task-execution \
  --task-arn arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh \
  --manifest-config {
      "Source": {
        "S3": {
            "ManifestObjectPath": "s3-object-key-of-manifest",
            "BucketAccessRoleArn": "bucket-iam-role",
            "S3BucketArn": "amzn-s3-demo-bucket-arn",
            "ManifestObjectVersionId": "manifest-version-to-use"
        }
      }
  }
```

2. For the `--task-arn` parameter, specify the Amazon Resource Name (ARN) of the task that you're starting.
3. For the `--manifest-config` parameter, do the following:

- `ManifestObjectPath` – Specify the S3 object key of your manifest.
- `BucketAccessRoleArn` – Specify the IAM role that allows DataSync to access your manifest in its S3 bucket.

  For more information, see Providing DataSync access to your manifest.

- `S3BucketArn` – Specify the ARN of the S3 bucket that's hosting your manifest.
- `ManifestObjectVersionId` – Specify the version of the manifest that you want DataSync to use.

By default, DataSync uses the latest version of the object.

4. Run the `start-task-execution` command to begin your transfer.

Limitations

- You can't use a manifest together with filters.
- You can't specify only a directory or folder with the intention of transferring all of its contents. For these situations, consider using an include filter instead of a manifest.
- You can't use the **Keep deleted files** task option (`PreserveDeletedFiles` in the API) to maintain files or objects in the destination that aren't in the source. DataSync only transfers what's listed in your manifest and doesn't delete anything in the destination.

Troubleshooting

Errors related to `HeadObject` or `GetObjectTagging`

If you're transferring objects with specific version IDs from an S3 bucket, you might see an error related to `HeadObject` or `GetObjectTagging`. For example, here's an error related to `GetObjectTagging`:

```
[WARN] Failed to read metadata for file /picture1.png (versionId: 111111): S3 Get
 Object Tagging Failed
[ERROR] S3 Exception: op=GetObjectTagging photos/picture1.png, code=403, type=15,
 exception=AccessDenied,
msg=Access Denied req-hdrs: content-type=application/xml, x-amz-api-version=2006-03-01
 rsp-hdrs: content-type=application/xml,
date=Wed, 07 Feb 2024 20:16:14 GMT, server=AmazonS3, transfer-encoding=chunked,
x-amz-id-2=IOWQ4fDEXAMPLEQM+ey7N9WgVhSnQ6JEXAMPLEZb7hSQDASK+Jd1vEXAMPLEa3Km, x-amz-
request-id=79104EXAMPLEB723
```

If you see either of these errors, validate that the IAM role that DataSync uses to access your S3 source location has the following permissions:

- `s3:GetObjectVersion`
- `s3:GetObjectVersionTagging`

If you need to update your role with these permissions, see Creating an IAM role for DataSync to access your Amazon S3 location.

Error: `ManifestFileDoesNotExist`

This error indicates that a file within the manifest was not found at the source. Review the guidelines for creating a manifest.

Next steps

If you haven't already, start your task. Otherwise, monitor your task's activity.

Transferring specific files, objects, and folders by using filters

AWS DataSync lets you apply filters to include or exclude data from your source location in a transfer. For example, if you don't want to transfer temporary files that end with `.tmp`, you can create an exclude filter so that these files don't make their way to your destination location.

You can use a combination of exclude and include filters in the same transfer task. If you modify a task's filters, those changes are applied the next time you run the task.

Filtering terms, definitions, and syntax

Familiarize yourself with the concepts related to DataSync filtering:

Filter

The whole string that makes up a particular filter (for example, `*.tmp|*.temp` or `/folderA|/folderB`).

Filters are made up of patterns delimited by using a pipe (|). You don't need a delimiter when you add patterns in the DataSync console because you add each pattern separately.

> **Note**
>
> Filters are case sensitive. For example, filter `/folderA` won't match `/FolderA`.

Pattern

A pattern within a filter. For example, `*.tmp` is a pattern that's part of the `*.tmp|*.temp` filter. If your filter has multiple patterns, you delimit each pattern by using a pipe (|).

Folders

- All filters are relative to the source location path. For example, suppose that you specify `/my_source/` as the source path when you create your source location and task and specify the include filter `/transfer_this/`. In this case, DataSync transfers only the directory `/my_source/transfer_this/` and its contents.
- To specify a folder directly under the source location, include a forward slash (/) in front of the folder name. In the example preceding, the pattern uses `/transfer_this`, not `transfer_this`.
- DataSync interprets the following patterns the same way and matches both the folder and its content.

  ```
  /dir
  ```

  ```
  /dir/
  ```

- When you are transferring data from or to an Amazon S3 bucket, DataSync treats the `/` character in the object key as the equivalent of a folder on a file system.

Special characters

Following are special characters for use with filtering.

Special character	Description
* (wildcard)	A character used to match zero or more characters. For example, `/movies_folder*` matches both `/movies_folder` and `/movies_folder1`.
| (pipe delimiter)	A character used as a delimiter between patterns. It enables specifying multiple patterns, any of which can match the filter. For example, `*.tmp|*.temp` matches files ending with either `tmp` or `temp`. **Note** This delimiter isn't needed when you add patterns on the console because you add each pattern on a separate line.

Special character	Description
\ (backslash)	A character used for escaping special characters (*, |, \) in a file or object name. A double backslash (\\) is required when a backslash is part of a file name. Similarly, \\\\ represents two consecutive backslashes in a file name. A backslash followed by a pipe (|) is required when a pipe is part of a file name. A backslash (\) followed by any other character, or at the end of a pattern, is ignored.

Example filters

The following examples show common filters you can use with DataSync.

> **Note**
>
> There are limits to how many characters you can use in a filter. For more information, see DataSync quotas.

Exclude some folders from your source location

In some cases, you want might exclude folders in your source location to not copy them to your destination location. For example, if you have temporary work-in-progress folders, you can use something like the following filter:

```
*/.temp
```

To exclude folders with similar content (such as `/reports2021` and `/reports2022`)), you can use an exclude filter like the following:

```
/reports*
```

To exclude folders at any level in the file hierarchy, you can use an exclude filter like the following.

`*/folder-to-exclude-1|*/folder-to-exclude-2`

To exclude folders at the top level of the source location, you can use an exclude filter like the following.

`/top-level-folder-to-exclude-1|/top-level-folder-to-exclude-2`

Include a subset of the folders on your source location

In some cases, your source location might be a large share and you need to transfer a subset of the folders under the root. To include specific folders, start a task execution with an include filter like the following.

`/folder-to-transfer/*`

Exclude specific file types

To exclude certain file types from the transfer, you can create a task execution with an exclude filter such as `*.temp`.

Transfer individual files you specify

To transfer a list of individual files, start a task execution with an include filter like the following: `"/folder/subfolder/file1.txt|/folder/subfolder/file2.txt|/folder/subfolder/file2.txt"`

Creating include filters

Include filters define the files, objects, and folders that you want DataSync to transfer. You can configure include filters when you create, edit, or start a task.

DataSync scans and transfers only files and folders that match the include filters. For example, to include a subset of your source folders, you might specify `/important_folder_1|/important_folder_2`.

> **Note**
>
> Include filters support the wildcard (*) character only as the rightmost character in a pattern. For example, `/documents*|/code*` is supported, but `*.txt` isn't.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For **Contents to scan**, choose **Specific files, objects, and folders**, then select **Using filters**.
5. For **Includes**, enter your filter (for example, `/important_folders` to include an important directory), then choose **Add pattern**.
6. Add other include filters as needed.

Using the AWS CLI

When using the AWS CLI, you must use single quotation marks (') around the filter and a | (pipe) as a delimiter if you have more than one filter.

The following example specifies two include filters `/important_folder1` and `/important_folder2` when running the `create-task` command.

```
aws datasync create-task
   --source-location-arn 'arn:aws:datasync:region:account-id:location/location-id' \
   --destination-location-arn 'arn:aws:datasync:region:account-id:location/location-id'
 \
   --includes FilterType=SIMPLE_PATTERN,Value='/important_folder1|/important_folder2'
```

Creating exclude filters

Exclude filters define the files, objects, and folders in your source location that you don't want DataSync to transfer. You can configure these filters when you create, edit, or start a task.

Topics

- Data excluded by default

Data excluded by default

DataSync automatically excludes some data from being transferred:

- `.snapshot` – DataSync ignores any path ending with `.snapshot`, which typically is used for point-in-time snapshots of a storage system's files or directories.
- `/.aws-datasync` and `/.awssync` – DataSync creates these folders in your location to help facilitate your transfer.
- `/.zfs` – You might see this folder with Amazon FSx for OpenZFS locations.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For **Excludes**, enter your filter (for example, `*/temp` to exclude temporary folders), then choose **Add pattern**.
5. Add other exclude filters as needed.
6. If needed, add include filters.

Using the AWS CLI

When using the AWS CLI, you must use single quotation marks (') around the filter and a | (pipe) as a delimiter if you have more than one filter.

The following example specifies two exclude filters `*/temp` and `*/tmp` when running the `create-task` command.

```
aws datasync create-task \
   --source-location-arn 'arn:aws:datasync:region:account-id:location/location-id' \
   --destination-location-arn 'arn:aws:datasync:region:account-id:location/location-id'
 \
   --excludes FilterType=SIMPLE_PATTERN,Value='*/temp|*/tmp'
```

Understanding how DataSync handles file and object metadata

AWS DataSync can preserve your file or object metadata during a data transfer. How your metadata gets copied depends on your transfer locations and if those locations use similar types of metadata.

System-level metadata

In general, DataSync doesn't copy system-level metadata. For example, when transferring from an SMB file server, the permissions you configured at the file system level aren't copied to the destination storage system.

There are exceptions. When transferring between Amazon S3 and other object storage, DataSync does copy some system-defined object metadata.

Metadata copied in Amazon S3 transfers

The following tables describe what metadata DataSync can copy when a transfer involves an Amazon S3 location.

Topics

To Amazon S3

When copying from one of these locations	To this location	DataSync can copy
• NFS • Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS)	• Amazon S3	The following as Amazon S3 user metadata: • File and folder modification timestamps • File and folder access timestamps (DataSync can only do this on a best-effort basis) • User ID and group ID • POSIX permissions

When copying from one of these locations	To this location	DataSync can copy
		The file metadata stored in Amazon S3 user metadata is interoperable with NFS shares on file gateways using AWS Storage Gateway. A file gateway enables low-latency access from on-premises networks to data that was copied to Amazon S3 by DataSync. This metadata is also interoperable with FSx for Lustre. When DataSync copies objects that contain this metadata back to an NFS server, the file metadata is restored. Restoring metadata requires granting elevated permissions to the NFS server. For more information, see Configuring AWS DataSync transfers with an NFS file server.

Between Amazon S3 and other object storage

When copying between these locations	DataSync can copy
• Object storage • Amazon S3	• User-defined object metadata • Object tags
• Microsoft Azure Blob Storage	• The following system-defined object metadata:

When copying between these locations	DataSync can copy
• Amazon S3	• Content-Disposition • Content-Encoding • Content-Language • Content-Type **Note**: DataSync copies system-level metadata for all objects during an initial transfer. If you configure your task to transfer only data that has changed, DataSync won't copy system metadata in subsequent transfers unless an object's content or user metadata has also been modified. DataSync doesn't copy other object metadata, such as object access control lists (ACLs), prior object versions, or the Last-Modified key.

Between Amazon S3 and HDFS

When copying between these locations	DataSync can copy
• Hadoop Distributed File System (HDFS) • Amazon S3	The following as Amazon S3 user metadata: • File and folder modification timestamps • File and folder access timestamps (DataSync can only do this on a best-effort basis) • User ID and group ID • POSIX permissions

When copying between these locations	DataSync can copy
	HDFS uses strings to store file and folder user and group ownership, rather than numeric identifiers, such as UIDs and GIDs.

Metadata copied in NFS transfers

The following table describes what metadata DataSync can copy between locations that use Network File System (NFS).

When copying between these locations	DataSync can copy
• NFS • Amazon EFS • Amazon FSx for Lustre • Amazon FSx for OpenZFS • Amazon FSx for NetApp ONTAP (using NFS)	• File and folder modification timestamps • File and folder access timestamps (DataSync can only do this on a best-effort basis) • User ID (UID) and group ID (GID) • POSIX permissions

Metadata copied in SMB transfers

The following table describes what metadata DataSync can copy between locations that use Server Message Block (SMB).

When copying between these locations	DataSync can copy
• SMB • Amazon FSx for Windows File Server • FSx for ONTAP (using SMB)	• File timestamps: access time, modification time, and creation time • File owner security identifier (SID) • Standard file attributes: read-only (R), archive (A), system (S), hidden (H), compressed (C), not content indexed (I), encrypted (E), temporary (T), offline (O), and sparse (P)

When copying between these locations	DataSync can copy
	DataSync attempts to copy the archive (A), compressed (C), not context indexed (I), sparse (P), and temporary (T) attributes on a best-effort basis. If these attributes aren't applied on the destination, they're ignored during task verification. • NTFS discretionary access lists (DACLs), which determine whether to grant access to an object. • NTFS system access control lists (SACLs), which are used by administrators to log attempts to access a secured object. **Note**: SACLs are not copied if you use SMB version 1.0. Copying DACLs and SACLs requires granting specific permissions to the Windows user that DataSync uses to access your location using SMB. For more informati on, see creating a location for SMB, FSx for Windows File Server, or FSx for ONTAP (depending on the type of location in your transfer).

Metadata copied in other transfer scenarios

DataSync handles metadata the following ways when copying between these storage systems (most of which have different metadata structures).

When copying from one of these locations	To one of these locations	DataSync can copy
• SMB • FSx for Windows File Server • FSx for ONTAP (using SMB)	• Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS) • Amazon S3 • Object storage • Azure Blob Storage • NFS	Default POSIX metadata for all files and folders on the destination file system or objects in the destination S3 bucket. This approach includes using the default POSIX user ID and group ID values. Windows-based metadata (such as ACLs) is not preserved.
• Object storage • Amazon S3 • Azure Blob Storage	• Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS)	Default POSIX metadata on the destination files and folders. This approach includes using the default POSIX user ID and group ID values.
• Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS)	• Azure Blob Storage	The following as user-defined metadata: • File and folder modification timestamps • File and folder access timestamps (DataSync can only do this on a best-effort basis) • User ID and group ID • POSIX permissions
• HDFS	• Amazon EFS • FSx for Lustre	• File and folder modification timestamps

When copying from one of these locations	To one of these locations	DataSync can copy
	• FSx for OpenZFS • FSx for ONTAP (using NFS)	• File and folder access timestamps (DataSync can only do this on a best-effort basis) • POSIX permissions HDFS stores file and folder user and group ownership as strings rather than numeric identifiers (such as UIDs and GIDs). Default values for UIDs and GIDs are applied on the destination file system. For more information, see Understanding when and how DataSync applies default POSIX metadata.
• Amazon S3 • Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for Windows File Server • FSx for ONTAP	• HDFS	File and folder timestamps from the source location. The file or folder owner is set based on the HDFS user or Kerberos principal you specified when creating the HDFS transfer location. The Groups Mapping configuration on the Hadoop cluster determines the group.

When copying from one of these locations	To one of these locations	DataSync can copy
• Amazon S3 • Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS) • Object storage • NFS • HDFS	• SMB • FSx for Windows File Server • FSx for ONTAP (using SMB)	File and folder timestamps from the source location. Ownership is set based on the Windows user that was specified in DataSync to access the Amazon FSx or SMB share. Permissions are inherited from the parent directory.
• Azure Blob Storage	• FSx for Windows File Server • FSx for ONTAP (using SMB)	

Understanding when and how DataSync applies default POSIX metadata

DataSync applies default POSIX metadata in the following situations:

- When your transfer's source and destination locations don't have similar metadata structures
- When metadata is missing from the source location

The following table describes how DataSync applies default POSIX metadata during these types of transfers:

Source	Destination	File permissions	Folder permissions	UID	GID
• Amazon S3[1] • Object storage[1]	• Amazon EFS • FSx for Lustre • FSx for OpenZFS	0755	0755	65534	65534

Source	Destination	File permissions	Folder permissions	UID	GID
• Microsoft Azure Blob Storage[1]	• FSx for ONTAP (using NFS) • NFS				
• SMB	• Amazon S3 • Object storage • Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS) • NFS	0644	0755	65534	65534
• HDFS	• Amazon EFS • FSx for Lustre • FSx for OpenZFS • FSx for ONTAP (using NFS) • NFS	0644	0755	65534	65534

[1] In cases where the objects don't have metadata that was previously applied by DataSync.

Links and directories copied by AWS DataSync

AWS DataSync handles hard links, symbolic links, and directories differently depending on the storage locations involved in your transfer.

Hard links

Here's how DataSync handles hard links in some common transfer scenarios:

- **When transferring between an NFS file server, FSx for Lustre, FSx for OpenZFS, FSx for ONTAP (using NFS), and Amazon EFS**, hard links are preserved.
- **When transferring to Amazon S3**, each underlying file referenced by a hard link is transferred only once. During incremental transfers, separate objects are created in your S3 bucket. If a hard link is unchanged in Amazon S3, it's correctly restored when transferred to an NFS file server, FSx for Lustre, FSx for OpenZFS, FSx for ONTAP (using NFS), or Amazon EFS file system.
- **When transferring to Microsoft Azure Blob Storage**, each underlying file referenced by a hard link is transferred only once. During incremental transfers, separate objects are created in your blob storage if there are new references in the source. When transferring from Azure Blob Storage, DataSync transfers hard links as if they are individual files.
- **When transferring between an SMB file server, FSx for Windows File Server, and FSx for ONTAP (using SMB)**, hard links aren't supported. If DataSync encounters hard links in these situations, the transfer task completes with an error. To learn more, check your CloudWatch logs.
- **When transferring to HDFS**, hard links aren't supported. CloudWatch logs show these links as skipped.

Symbolic links

Here's how DataSync handles symbolic links in some common transfer scenarios:

- **When transferring between an NFS file server, FSx for Lustre, FSx for OpenZFS, FSx for ONTAP (using NFS), and Amazon EFS**, symbolic links are preserved.
- **When transferring to Amazon S3**, the link target path is stored in the Amazon S3 object. The link is correctly restored when transferred to an NFS file server, FSx for Lustre, FSx for OpenZFS, FSx for ONTAP, or Amazon EFS file system.
- **When transferring to Azure Blob Storage**, symbolic links aren't supported. CloudWatch logs show these links as skipped.

- **When transferring between an SMB file server, FSx for Windows File Server, and FSx for ONTAP (using SMB)**, symbolic links aren't supported. DataSync doesn't transfer a symbolic link itself but instead a file referenced by the symbolic link. To recognize duplicate files and deduplicate them with symbolic links, you must configure deduplication on your destination file system.
- **When transferring to HDFS**, symbolic links aren't supported. CloudWatch logs show these links as skipped.

Directories

In general, DataSync preserves directories when transferring between storage systems. This isn't the case in the following situations:

- **When transferring to Amazon S3**, directories are represented as empty objects that have prefixes and end with a forward slash (/).
- **When transferring to Azure Blob Storage without a hierarchical namespace**, directories don't exist. What looks like a directory is just part of an object name.

Configuring how to handle files, objects, and metadata

You can configure how AWS DataSync handles your files, objects, and their associated metadata when transferring between locations.

For example, with recurring transfers, you might want to overwrite files in your destination with changes in the source to keep the locations in sync. You can copy properties such as POSIX permissions for files and folders, tags associated with objects, and access control lists (ACLs).

Transfer mode options

You can configure whether DataSync transfers only the data (including metadata) that's changed following an initial copy or all data every time you run the task. If you're planning on recurring transfers, you might only want to transfer what's changed since your previous task execution.

Option in console	Option in API	Description
Transfer only data that has changed	TransferMode set to CHANGED	After your initial full transfer, DataSync copies only the data

Option in console	Option in API	Description
		and metadata that differs between the source and destination location.
Transfer all data	TransferMode set to ALL	DataSync copies everything in the source to the destination without comparing differenc es between the locations.

File and object handling options

You can control some aspects of how DataSync treats your files or objects in the destination location. For example, DataSync can delete files in the destination that aren't in the source.

Option in console	Option in API	Description
Keep deleted files	PreserveDeletedFiles	Specifies whether DataSync maintains files or objects in the destination location that don't exist in the source. If you configure your task to delete objects from your Amazon S3 bucket, you might incur minimum storage duration charges for certain storage classes. For detailed information, see Storage class considerations with Amazon S3 transfers. **Warning** You can't configure your task to delete data in the destinati

Option in console	Option in API	Description
		on and also transfer all data. When you transfer all data, DataSync doesn't scan your destination location and doesn't know what to delete.
Overwrite files	OverwriteMode	Specifies whether DataSync modifies data in the destination location when the source data or metadata has changed. If you don't configure your task to overwrite data, the destination data isn't overwritten even if the source data differs. If your task overwrites objects, you might incur additional charges for certain storage classes (for example, for retrieval or early deletion). For detailed information, see Storage class considerations with Amazon S3 transfers.

Metadata handling options

DataSync can preserve file and object metadata during a transfer. The metadata that DataSync can preserve depends on the storage systems involved and whether those systems use a similar metadata structure.

Before configuring your task, make sure that you understand how DataSync handles metadata and special files when transferring between your source and destination locations.

Important

DataSync supports transfers to and from certain third-party cloud storage systems, such as Google Cloud Storage and IBM Cloud Object Storage, which handle system metadata in a way that is not fully S3-compatible. For these transfers, DataSync attempts to copy metadata attributes such as `ContentType`, `ContentEncoding`, `ContentLanguage`, and `CacheControl` on a best-effort basis. If the destination storage system does not apply these attributes, they will be ignored during task verification.

Option in console	Option in API	Description
Copy ownership	Gid and Uid	Specifies whether DataSync copies POSIX file and folder ownership, such as the group ID of the file's owners and the user ID of the file's owner.
Copy permissions	PosixPermissions	Specifies whether DataSync copies POSIX permissions for files and folders from the source to the destination.
Copy timestamps	Atime and Mtime	Specifies whether DataSync copies the timestamp metadata from the source to the destination. Required when you need to run a task more than once.
Copy object tags	ObjectTags	Specifies whether DataSync preserves the tags associate d with your objects when transferring between object storage systems.

Option in console	Option in API	Description
Copy ownership, DACLs, and SACLs	SecurityDescriptorCopyFlags set to `OWNER_DACL_SACL`	DataSync copies the following : • The object owner. • NTFS discretionary access lists (DACLs), which determine whether to grant access to an object. • NTFS system access control lists (SACLs), which are used by administrators to log attempts to access a secured object. **Note**: SACLs are not copied if you use SMB version 1.0. Copying DACLs and SACLs requires granting specific permissions to the Windows user that DataSync uses to access your location using SMB. For more information, see creating a location for SMB, FSx for Windows File Server, or FSx for ONTAP (depending on the type of location in your transfer).

Option in console	Option in API	Description
Copy ownership and DACLs	SecurityDescriptorCopyFlags set to OWNER_DACL	DataSync copies the following : • The object owner. • DACLs, which determine whether to grant access to an object. DataSync won't copy SACLs when you choose this option.
Do not copy ownership or ACLs	SecurityDescriptorCopyFlags set to NONE	DataSync doesn't copy any ownership or permissio ns data. The objects that DataSync writes to your destination location are owned by the user whose credentials are provided for DataSync to access the destination. Destinati on object permissions are determined based on the permissions configured on the destination server.

Configuring file, object, and metadata handling options

You can configure how DataSync handles files, objects, and metadata when creating, editing, or starting your transfer task.

Using the DataSync console

The following instructions describe how to configure file, object, and metadata handling options when creating a task.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For **Transfer mode**, choose one of the following options:

   - **Transfer only data that has changed**
   - **Transfer all data**

   For more information about these options, see Transfer mode options.
5. Select **Keep deleted files** if you want DataSync to maintain files or objects in the destination location that don't exist in the source.

   If you don't choose this option and your task deletes objects from your Amazon S3 bucket, you might incur minimum storage duration charges for certain storage classes. For detailed information, see Storage class considerations with Amazon S3 transfers.

   > **Warning**
   >
   > You can't deselect this option and enable **Transfer all data**. When you transfer all data, DataSync doesn't scan your destination location and doesn't know what to delete.
6. Select **Overwrite files** if you want DataSync to modify data in the destination location when the source data or metadata has changed.

   If your task overwrites objects, you might incur additional charges for certain storage classes (for example, for retrieval or early deletion). For detailed information, see Storage class considerations with Amazon S3 transfers.

   If you don't choose this option, the destination data isn't overwritten even if the source data differs.
7. Under **Transfer options**, select how you want DataSync to handle metadata. For more information about the options, see Metadata handling options.

> **Important**
>
> The options you see in the console depend on your task's source and destination locations. You might have to expand **Additional settings** to see some of these options.

- **Copy ownership**
- **Copy permissions**
- **Copy timestamps**
- **Copy object tags**
- **Copy ownership, DACLs, and SACLs**
- **Copy ownership and DACLs**
- **Do not copy ownership or ACLs**

Using the DataSync API

You can configure file, object, and metadata handling options by using the `Options` parameter with any of the following operations:

- CreateTask
- StartTaskExecution
- UpdateTask

Configuring how AWS DataSync verifies data integrity

During a transfer, AWS DataSync uses checksum verification to verify the integrity of the data that you copy between locations. You also can configure DataSync to perform additional verification at the end of your transfer.

Data verification options

Use the following information to help you decide if and how you want DataSync to perform these additional checks.

Console option	API option	Description
Verify only transferred data (recommended)	VerifyMode set to `ONLY_FILES_TRANSFERRED`	DataSync calculates the checksum of transferred data (including metadata) at the source location. At the end of your transfer, DataSync compares this checksum to the checksum calculated on that same data at the destination. We recommend this option when transferring to S3 Glacier Flexible Retrieval or S3 Glacier Deep Archive storage classes. For more information, see Storage class considerations with Amazon S3 transfers.
Verify all data	VerifyMode set to `POINT_IN_TIME_CONSISTENT`	At the end of your transfer, DataSync checks the entire source and destination to verify that both locations are fully synchronized. **Note** Not supported when your task uses Enhanced mode. If you use a manifest, DataSync only scans and

Console option	API option	Description
		verifies what's listed in the manifest. You can't use this option when transferring to S3 Glacier Flexible Retrieval or S3 Glacier Deep Archive storage classes. For more information, see Storage class considerations with Amazon S3 transfers.
Don't verify data after transfer	VerifyMode set to NONE	DataSync performs data integrity checks only during your transfer. Unlike other options, there's no additional verification at the end of your transfer.

Configuring data verification

You can configure data verification options when creating a task, updating a task, or starting a task execution.

Using the DataSync console

The following instructions describe how to configure data verification options when creating a task.

To configure data verification by using the console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?

4. For **Verification**, choose one of the following:

   - **Verify only transferred data** (recommended)
   - **Verify all data**
   - **Don't verify data after transfer**

Using the DataSync API

You can configure how DataSync verifies data by using the `VerifyMode` parameter with any of the following operations:

- CreateTask
- UpdateTask
- StartTaskExecution

Setting bandwidth limits for your AWS DataSync task

You can configure network bandwidth limits for your AWS DataSync task and each of its executions.

Limiting bandwidth for a task

Set a bandwidth limit when creating, editing, or starting a task.

Using the DataSync console

The following instructions describe how to configure a bandwidth limit for your task when you're creating it.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For **Bandwidth limit**, choose one of the following:

   - Select **Use available** to use all of the available network bandwidth for each task execution.

- Select **Set bandwidth limit (MiB/s)** and enter the maximum bandwidth that you want DataSync to use for each task execution.

Using the DataSync API

You can configure a task's bandwidth limit by using the `BytesPerSecond` parameter with any of the following operations:

- CreateTask
- UpdateTask
- StartTaskExecution

Throttling bandwidth for a task execution

You can modify the bandwidth limit for a running or queued task execution.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the navigation pane, expand **Data transfer**. then choose **Tasks**.
3. Choose the task and then select **History** to view the task's executions.
4. Choose the task execution that you want to modify and then choose **Edit**.
5. In the dialog box, choose one of the following:
   - Select **Use available** to use all of the available network bandwidth for the task execution.
   - Select **Set bandwidth limit (MiB/s)** and enter the maximum bandwidth that you want DataSync to use for the task execution.
6. Choose **Save changes**.

   The new bandwidth limit takes effect within 60 seconds.

Using the DataSync API

You can modify the bandwidth limit for a running or queued task execution by using the `BytesPerSecond` parameter with the UpdateTaskExecution operation.

Scheduling when your AWS DataSync task runs

You can set up an AWS DataSync task schedule to periodically transfer data between storage locations.

How DataSync task scheduling works

A scheduled DataSync task runs at a frequency that you specify, with a minimum interval of 1 hour. You can create a task schedule by using a cron or rate expressions.

> **Important**
>
> You can't schedule a task to run at an interval faster than 1 hour.

Using cron expressions

Use cron expressions for task schedules that run on a specific time and day. For example, here's how you can configure a task schedule in the AWS CLI that runs at 12:00 PM UTC every Sunday and Wednesday.

```
cron(0 12 ? * SUN,WED *)
```

Using rate expressions

Use rate expressions for task schedules that run on a regular interval, such as every 12 hours. For example, here's how you can configure a task schedule in the AWS CLI that runs every 12 hours:

```
rate(12 hours)
```

> **Tip**
>
> For more information about cron and rate expression syntax, see the *Amazon EventBridge User Guide*.

Creating a DataSync task schedule

You can schedule how frequently your task runs by using the DataSync console, AWS CLI, or DataSync API.

Using the DataSync console

The following instructions describe how to set up a schedule when creating a task. You can modify the schedule later when editing the task.

In the console, some scheduling options let you specify the exact time that your task runs (such as daily at 10:30 PM). If you don't include a time for these options, your task runs at the time that you create (or update) the task.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. For schedule **Frequency**, do one of the following:

   - Choose **Not scheduled** if you don't want your task to run on a schedule.
   - Choose **Hourly**, then choose the minute during the hour that you want your task to run.
   - Choose **Daily** and enter the UTC time that you want your task to run.
   - Choose **Weekly** and the day of the week and enter the UTC time that you want the task to run.
   - Choose **Days of the week**, choose a specific day or days, and enter the UTC time that the task should run in the format HH:MM.
   - Choose **Custom**, and then select **Cron expression** or **Rate expression**. Enter your task schedule with a minimum interval of 1 hour.

Using the AWS CLI

You can create a schedule for your DataSync task by using the `--schedule` parameter with the `create-task`, `update-task`, or `start-task-execution` command.

The following instructions describe how to do this with the `create-task` command.

1. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh \
  --destination-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-abcdefgh12345678 \
  --schedule '{
    "ScheduleExpression": "cron(0 12 ? * SUN,WED *)"
  }'
```

2. For the `--source-location-arn` parameter, specify the Amazon Resource Name (ARN) of the location that you're transferring data from.
3. For the `--destination-location-arn` parameter, specify the ARN of the location that you're transferring data to.
4. For the `--schedule` parameter, specify a cron or rate expression for your schedule.

   In the example, the cron expression *`cron(0 12 ? * SUN,WED *)`* sets a task schedule that runs at 12:00 PM UTC every Sunday and Wednesday.
5. Run the `create-task` command to create your task with the schedule.

Pausing a DataSync task schedule

There can be situations where you need to pause your DataSync task schedule. For example, you might need to temporarily disable a recurring transfer to fix an issue with your task or perform maintenance on your storage system.

DataSync might disable your task schedule automatically for the following reasons:

- Your task fails repeatedly with the same error.
- You disable an AWS Region that your task is using.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, and then choose **Tasks**.
3. Choose the task that you want to pause the schedule for, and then choose **Edit**.
4. For **Schedule**, turn off **Enable schedule**. Choose **Save changes**.

Using the AWS CLI

1. Copy the following `update-task` command:

```
aws datasync update-task \
  --task-arn arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh \
  --schedule '{
    "ScheduleExpression": "cron(0 12 ? * SUN,WED *)",
    "Status": "DISABLED"
  }'
```

2. For the `--task-arn` parameter, specify the ARN of the task that you want to pause the schedule for.
3. For the `--schedule` parameter, do the following:
   - For `ScheduleExpression`, specify a cron or rate expression for your schedule.

     In the example, the expression *`cron(0 12 ? * SUN,WED *)`* sets a task schedule that runs at 12:00 PM UTC every Sunday and Wednesday.
   - For `Status`, specify `DISABLED` to pause the task schedule.
4. Run the `update-task` command.
5. To resume the schedule, run the same `update-task` command with `Status` set to `ENABLED`.

Checking the status of a DataSync task schedule

You can see whether your DataSync task schedule is enabled.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, and then choose **Tasks**.
3. In the **Schedule** column, check whether the task's schedule is enabled or disabled.

Using the AWS CLI

1. Copy the following `describe-task` command:

```
aws datasync describe-task \
```

```
  --task-arn arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh
```

2. For the `--task-arn` parameter, specify the ARN of the task that you want information about.
3. Run the `describe-task` command.

You get a response that provides details about your task, including its schedule. (The following example focuses primarily on the task schedule configuration and doesn't show a full `describe-task` response.)

The example shows that the task's schedule is manually disabled. If the schedule is disabled by the DataSync `SERVICE`, you see an error message for `DisabledReason` to help you understand why the task keeps failing. For more information, see ???.

```
{
    "TaskArn": "arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh",
    "Status": "AVAILABLE",
    "Schedule": {
        "ScheduleExpression": "cron(0 12 ? * SUN,WED *)",
        "Status": "DISABLED",
        "StatusUpdateTime": 1697736000,
        "DisabledBy": "USER",
        "DisabledReason": "Manually disabled by user."
    },
    ...
}
```

Tagging your AWS DataSync tasks

Tags are key-value pairs that help you manage, filter, and search for your AWS DataSync resources. You can add up to 50 tags to each DataSync task and task execution.

For example, you might create a task for a large data migration and tag the task with the key **`Project`** and value **`Large Migration`**. To further organize the migration, you could tag one run of the task with the key **`Transfer Date`** and value **`May 2021`** (subsequent task executions might be tagged **`June 2021`**, **`July 2021`**, and so on).

Tagging your DataSync task

You can tag your DataSync task only when creating the task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. On the **Configure settings** page, choose **Add new tag** to tag your task.

Using the AWS CLI

1. Copy the following `create-task` command:

```
aws datasync create-task \
    --source-location-arn 'arn:aws:datasync:region:account-id:location/source-location-id' \
    --destination-location-arn 'arn:aws:datasync:region:account-id:location/destination-location-id' \
    --tags Key=tag-key,Value=tag-value
```

2. Specify the following parameters in the command:

   - `--source-location-arn` – Specify the Amazon Resource Name (ARN) of the source location in your transfer.
   - `--destination-location-arn` – Specify the ARN of the destination location in your transfer.
   - `--tags` – Specify the tags that you want to apply to the task.

     For more than one tag, separate each key-value pair with a space.
3. (Optional) Specify other parameters that make sense for your transfer scenario.

   For a list of `--options`, see the create-task command.
4. Run the `create-task` command.

   You get a response that shows the task that you just created.

```
{
```

```
    "TaskArn": "arn:aws:datasync:us-east-2:123456789012:task/task-
abcdef01234567890"
}
```

To view the tags you added to this task, you can use the list-tags-for-resource command.

Tagging your DataSync task execution

You can tag each run of your DataSync task.

If your task already has tags, remember the following about using tags with task executions:

- If you start your task with the console, its user-created tags are applied automatically to the task execution. However, system-created tags that begin with `aws:` are not applied.
- If you start your task with the DataSync API or AWS CLI, its tags are not applied automatically to the task execution.

Using the DataSync console

To add, edit, or remove tags from a task execution, you must start the task with overriding options.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**.
3. Choose the task.
4. Choose **Start**, then choose one of the following options:
   - **Start with defaults** – Applies any tags associated with your task.
   - **Start with overriding options** – Allows you to add, edit, or remove tags for this particular task execution.

Using the AWS CLI

1. Copy the following `start-task-execution` command:

```
aws datasync start-task-execution \
    --task-arn 'arn:aws:datasync:region:account-id:task/task-id' \
    --tags Key=tag-key,Value=tag-value
```

2. Specify the following parameters in the command:

   - `--task-arn` – Specify the ARN of the task that you want to start.
   - `--tags` – Specify the tags that you want to apply to this specific run of the task.

     For more than one tag, separate each key-value pair with a space.
3. (Optional) Specify other parameters that make sense for your situation.

   For more information, see the start-task-execution command.
4. Run the `start-task-execution` command.

   You get a response that shows the task execution that you just started.

```
{
    "TaskExecutionArn": "arn:aws:datasync:us-east-2:123456789012:task/task-
abcdef01234567890"
}
```

To view the tags you added to this task, you can use the list-tags-for-resource command.

Starting a task to transfer your data

Once you create your AWS DataSync transfer task, you can start moving data. Each run of a task is called a *task execution*. For information about what happens during a task execution, see How DataSync transfers files, objects, and directories.

> **Important**
>
> If you're planning to transfer data to or from an Amazon S3 location, review how DataSync can affect your S3 request charges and the DataSync pricing page before you begin.

Starting your task

Once you've created your task, you can begin moving data right away.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**.
3. Choose the task that you want to run.

   Make sure that the task has an **Available** status. You also can select multiple tasks.
4. Choose **Actions** and then choose one of the following options:

   - **Start** – Runs the task (or tasks if you selected more than one).
   - **Start with overriding options** – Allows you to modify some of your task settings before you begin moving data. When you're ready, choose **Start**.
5. Choose **See execution details** to view details about the running task execution.

Using the AWS CLI

To start your DataSync task, you just need to specify the Amazon Resource Name (ARN) of the task you want to run. Here's an example `start-task-execution` command:

```
aws datasync start-task-execution \
    --task-arn 'arn:aws:datasync:region:account-id:task/task-id'
```

The following example starts a task with a few settings that are different than the task's default settings:

```
aws datasync start-task-execution \
    --override-options VerifyMode=NONE,OverwriteMode=NEVER,PosixPermissions=NONE
```

The command returns an ARN for your task execution similar to the following example:

```
{
    "TaskExecutionArn": "arn:aws:datasync:us-east-1:209870788375:task/
task-08de6e6697796f026/execution/exec-04ce9d516d69bd52f"
}
```

> **Note**
>
> Each agent can run a single task at a time.

Using the DataSync API

You can start your task by using the StartTaskExecution operation. Use the DescribeTaskExecution operation to get details about the running task execution.

Once started, you can check the task execution's status as DataSync copies your data. You also can throttle the task execution's bandwidth if needed.

Task execution statuses

When you start a DataSync task, you might see these statuses. (Task statuses are different than task execution statuses.)

Console status	API status	Description
Queueing	`QUEUED`	Another task execution is running and using the same DataSync agent. For more information, see Knowing when your task is queued.
Launching	`LAUNCHING`	DataSync is initializing the task execution. This status usually goes quickly but can take up to a few minutes.
Launched	`LAUNCHED`	DataSync has launched the task execution.
Preparing	`PREPARING`	DataSync is determining what data to transfer. Preparation can take just minutes, a few hours, or even longer depending on the number of files, objects, or directories in both locations and how you configure your task. How preparation works also depends on your task mode. For more information, see How DataSync prepares your data transfer.
Transferring	`TRANSFERRING`	DataSync is performing the actual data transfer.
Verifying	`VERIFYING`	DataSync is verifying the integrity of your data at the end of the transfer.
Success	`SUCCESS`	The task execution succeeded.

Console status	API status	Description
Cancelling	CANCELLING	The task execution is in the process of being cancelled.
Error	ERROR	The task execution failed.

Knowing when your task is queued

When running multiple tasks (for example, you're transferring a large dataset), DataSync might queue the tasks to run in a series (first in, first out). Some examples of when this happens include:

- You run different tasks that use the same DataSync agent. While you can use the same agent for multiple tasks, an agent can only run one task at a time.
- A task execution is in progress and you start additional executions of the same task using different filters or manifests.

In each example, the queued tasks don't start until the task ahead of them finishes.

Cancelling your task execution

You can stop any running or queued DataSync task execution.

To cancel a task execution by using the console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**.
3. Select the **Task ID** for the running task that you want to monitor.

   The task status should be **Running**.
4. Choose **History** to view the task's executions.
5. Select the task execution that you want to stop, and then choose **Stop**.
6. In the dialog box, choose **Stop**.

To cancel a running or queued task by using the DataSync API, see CancelTaskExecution.

Automated cancellation of stuck tasks

At times a running DataSync task execution can become stuck.

Discovering your storage with AWS DataSync Discovery

AWS DataSync Discovery helps you accelerate your migration to AWS. With DataSync Discovery, you can do the following:

- **Understand how your on-premises storage is used** – DataSync Discovery provides detailed reporting about your storage system resources, including utilization, capacity, and configuration information.
- **Get recommendations about migrating your data to AWS** – DataSync Discovery can suggest AWS storage services (such as Amazon FSx for NetApp ONTAP, Amazon EFS, and Amazon FSx for Windows File Server) for your data. Recommendations include a cost estimate and help you understand how to configure a suggested storage service. When you're ready, you can then use DataSync to migrate your data to AWS.

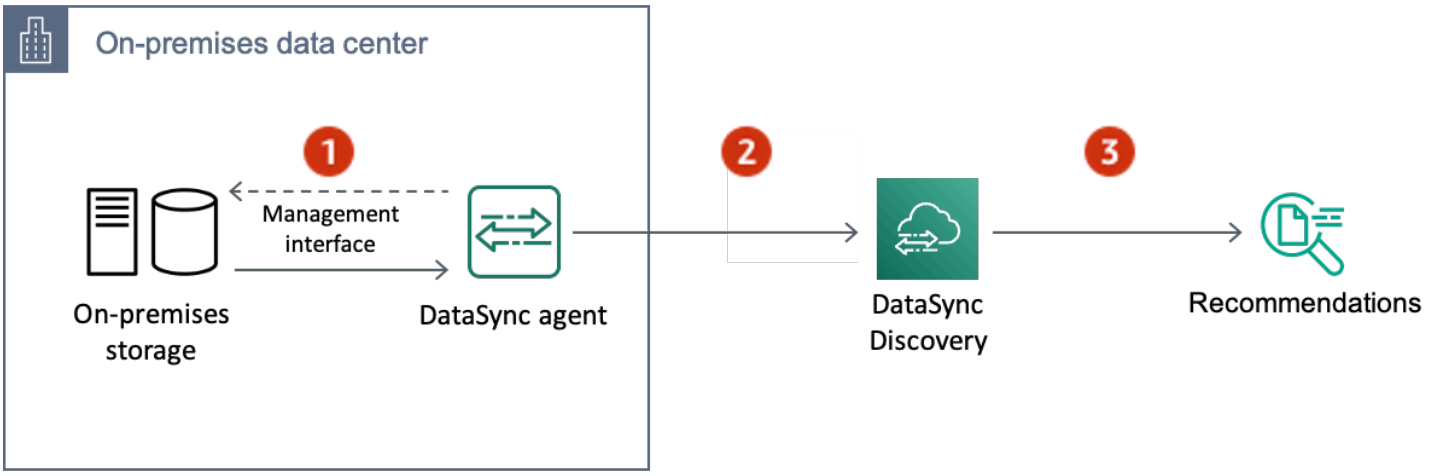
Topics

How AWS DataSync Discovery works

Learn the key concepts and terminology related to AWS DataSync Discovery.

DataSync Discovery architecture

The following diagram illustrates how DataSync Discovery collects information and provides recommendations for migrating data from an on-premises storage system to AWS.



Reference	Description
1	A DataSync agent connects to your on-premises storage system's management interface (using port 443, for example). You then run a discovery job to collect information about your system.
2	The agent sends the information that it collects to DataSync Discovery through a public service endpoint.
3	Using the information that it collects, DataSync Discovery recommends AWS storage services that you can migrate your data to.

Concepts and terminology

Familiarize yourself with DataSync Discovery features.

Topics

- Agent
- Discovery job
- Storage system resource information
- AWS storage recommendations

Agent

An *agent* is a virtual machine (VM) appliance that DataSync Discovery uses to access the management interface of your on-premises storage system. The agent collects (reads) information about how your storage resources are performing and being used.

You can deploy an agent in your storage environment on VMware ESXi, Linux Kernel-based Virtual Machine (KVM), or Microsoft Hyper-V hypervisors. For storage in a virtual private cloud (VPC) in AWS, you can deploy an agent as an Amazon EC2 instance.

A DataSync Discovery agent is no different than an agent that you can use for DataSync transfers, but we don't recommend using the same agent for these scenarios.

To get started, see Deploying your AWS DataSync agent.

Discovery job

You run a *discovery job* to collect information about your on-premises storage system through the storage system's management interface.

You can run a discovery job between 1 hour and 31 days. You'll get more accurate AWS storage recommendations the longer your discovery job runs.

For more information, see Working with DataSync discovery jobs.

Storage system resource information

DataSync Discovery can give you performance and utilization information about your on-premises storage system's resources. For example, get an idea about how much storage capacity is being used in a specific storage volume compared to how much capacity you originally provisioned.

You can view this information as your discovery job collects it by using the following:

- The DescribeStorageSystemResources operation
- The DescribeStorageSystemResourceMetrics operation

For more information, see Viewing storage resource information collected by AWS DataSync Discovery.

AWS storage recommendations

Using the information that it collects about your on-premises storage system's resources, DataSync Discovery recommends AWS storage services to help plan your migration to AWS.

You can view recommendations by using the DescribeStorageSystemResources operation.

For more information, see Getting recommendations from AWS DataSync Discovery.

Limitations

- Currently, you can only activate DataSync Discovery agents with public service endpoints.

Adding your on-premises storage system to DataSync Discovery

Specify an on-premises storage system that you want AWS DataSync Discovery to collect information about and provide AWS storage migration recommendations for.

> **Note**
>
> DataSync Discovery currently supports NetApp Fabric-Attached Storage (FAS) and All Flash FAS (AFF) systems that are running ONTAP 9.7 or later.

Accessing your on-premises storage system

To collect information about your on-premises storage system, DataSync Discovery needs credentials that provide read access to your storage system's management interface. For security, DataSync Discovery stores these credentials in AWS Secrets Manager.

> **Important**
>
> If you update these credentials on your storage system, make sure to also update them in DataSync Discovery. You can do this by using the UpdateStorageSystem operation.

How DataSync Discovery uses AWS Secrets Manager

AWS Secrets Manager is a secret storage service that protects database credentials, API keys, and other secret information. DataSync Discovery uses Secrets Manager to protect the credentials that you provide for accessing your on-premises storage system.

Secrets Manager encrypts secrets using AWS Key Management Service keys. For more information, see Secret encryption and decryption.

You can configure Secrets Manager to automatically rotate secrets for you according to a schedule that you specify. This enables you to replace long-term secrets with short-term ones, which helps to significantly reduce the risk of compromise. For more information, see Rotate AWS Secrets Manager secrets.

You pay for credentials stored in Secrets Manager. For more information, see AWS Secrets Manager Pricing.

Adding your on-premises storage system

You must provide some information about your storage system before DataSync Discovery can collect information about it.

Using the AWS CLI

Using the AWS Command Line Interface (AWS CLI), configure DataSync Discovery to work with your on-premises storage system.

Before you begin: We recommend that you enable logging with CloudWatch.

To add an on-premises storage system by using the AWS CLI

1. Copy the following `add-storage-system` command:

```
aws datasync add-storage-system \
  --server-configuration ServerHostname="domain-or-ip",ServerPort=network-port \
  --system-type storage-system-type \
  --credentials Username="your-management-interface-username",Password="your-
management-interface-password"
  --agent-arns "agent-arn"
```

2. Specify the following required parameters in the command:

- `--server-configuration ServerHostname` – Specify the domain name or IP address of your storage system's management interface.
- `--server-configuration ServerPort` – Specify the network port that's needed to connect with the system's management interface.
- `--system-type` – Specify the type of storage system that you're adding.
- `--credentials` – Include the following options:
  - `Username` – Specify the user name needed to access your storage system's management interface.
  - `Password` – Specify the password needed to access your storage system's management interface.

    For more information, see Accessing your on-premises storage system.
- `--agent-arns` – Specify the DataSync agent that you want to connect to your storage system's management interface.

  If you don't haven't an agent, see Deploying your AWS DataSync agent.

3. (Optional) Add any of the following parameters to the command:

- `--cloud-watch-log-group-arn` – Specify the Amazon Resource Name (ARN) of the CloudWatch log group that you want to use to log DataSync Discovery activity.
- `--tags` – Specify a `Key` and `Value` to tag the DataSync resource that's representing your storage system.

  A *tag* is a key-value pair that helps you manage, filter, and search for your DataSync resources.
- `--name` – Specify a name for your storage system.

4. Run the `add-storage-system` command.

   You get a response that shows you the storage system ARN that you just added.

```
{
    "StorageSystemArn": "arn:aws:datasync:us-east-1:123456789012:system/storage-
system-abcdef01234567890"
}
```

After you add the storage system, you can run a discovery job to collect information about the storage system.

Removing your on-premises storage system

When you remove an on-premises storage system from DataSync Discovery, you permanently delete any associated discovery jobs, collected data, and recommendations.

Using the AWS CLI

1. Copy the following `remove-storage-system` command:

   ```
   aws datasync remove-storage-system --storage-system-arn "your-storage-system-arn"
   ```

2. For `--storage-system-arn`, specify the ARN of your storage system.
3. Run the `remove-storage-system` command.

   If successful, you get an HTTP 200 response with an empty HTTP body.

Logging DataSync Discovery activity to Amazon CloudWatch

When you enable logging with Amazon CloudWatch, you can more easily troubleshoot issues with DataSync Discovery. For example, if your discovery job is interrupted, you can check the logs to locate the issue. If you resolve the problem within 12 hours of when it occurred, your discovery job picks up where it left off.

If you configure your system by using the AWS CLI, you must create a log group with a resource policy that allows DataSync to log events to the log group. You can use a log group resource policy similar to one for DataSync tasks, with some differences:

- For the service principal, use `discovery-datasync.amazonaws.com`.
- If you're using the `ArnLike` condition, specify a storage system ARN like this:

```
"ArnLike": {
  "aws:SourceArn": [
    "arn:aws:datasync:region:account-id:system/*"
   ]
},
```

Working with DataSync discovery jobs

After you deploy your AWS DataSync agent and add your on-premises storage system to DataSync Discovery, you can run discovery jobs to collect information about the system and get AWS migration recommendations.

Starting a discovery job

You can run a discovery job for up to 31 days. A storage system can have only one active discovery job at a time. The information that a discovery job collects is available for up to 60 days following the end of the job (unless you remove the related storage system from DataSync Discovery before that).

> **Tip**
>
> DataSync Discovery can provide more accurate recommendations the longer your discovery job runs. We recommend running a discovery job for at least 14 days.

Using the AWS CLI

With the AWS Command Line Interface (AWS CLI), you can run a discovery job for as short as 1 hour.

1. Copy the following `start-discovery-job` command:

```
aws datasync start-discovery-job \
  --storage-system-arn "your-storage-system-arn" \
  --collection-duration-minutes discovery-job-duration
```

2. Specify the following parameters in the command:

   - `--storage-system-arn` – Specify the Amazon Resource Name (ARN) of the on-premises storage system that you added to DataSync Discovery.
   - `--collection-duration-minutes` – Specify how long that you want the discovery job to run in minutes. Enter a value between `60` (1 hour) and `44640` (31 days).

3. Run the `start-discovery-job` command.

   You get a response that shows the discovery job that you just started.

```
{
    "DiscoveryJobArn": "arn:aws:datasync:us-east-1:123456789012:system/storage-
system-abcdef01234567890/job/discovery-job-12345678-90ab-cdef-0abc-021345abcdef6"
}
```

Shortly after starting the discovery job, you can begin looking at the information that the job collects (including storage system capacity and usage).

Stopping a discovery job

Stop a discovery job at any time. You can still get recommendations for a stopped job.

Using the AWS CLI

1. Copy the following `stop-discovery-job` command:

   ```
   aws datasync stop-discovery-job --discovery-job-arn "your-discovery-job-arn"
   ```

2. For `--discovery-job-arn`, specify the ARN of the discovery job that's currently running.
3. Run the `stop-discovery-job` command.

   If successful, you get an HTTP 200 response with an empty HTTP body.

Viewing storage resource information collected by AWS DataSync Discovery

AWS DataSync Discovery collects information about your on-premises storage system that can help you understand how its storage resources are configured, performing, and utilized. DataSync Discovery uses this information to generate recommendations for migrating your data to AWS.

A discovery job can give you the following information about your storage system's resources (such as its volumes):

- Total, available, and in use storage capacity
- Number of Common Internet File System (CIFS) shares in a resource and whether a resource is available via Network File System (NFS)
- Data transfer protocols

- Performance (such as IOPS, throughput, and latency)

Viewing information collected about your storage system

You can begin to see what kind of information DataSync Discovery is collecting about your on-premises storage system shortly after you start a discovery job.

You can view this information by using the following options:

- **The DescribeStorageSystemResources operation** – Get data about all of the storage system resources that DataSync Discovery can collect information about, including utilization, capacity, and configuration data.
- **The DescribeStorageSystemResourceMetrics operation** – Get performance and capacity information that DataSync Discovery can collect about a specific resource in your storage system.

Using the AWS CLI

The following steps show how to use the DescribeStorageSystemResources operation with the AWS CLI.

1. Copy the following `describe-storage-system-resources` command:

```
aws datasync describe-storage-system-resources \
  --discovery-job-arn "your-discovery-job-arn" \
  --resource-type "storage-system-resource-type"
```

2. Specify the following parameters in the command:
   - `--discovery-job-arn` – Specify the Amazon Resource Name (ARN) of the discovery job that you ran.
   - `--resource-type` – Specify one of the following values, depending on what kind of storage system resources you want information about:
     - `CLUSTER`
     - `SVM`
     - `VOLUME`
3. (Optional) Specify the `--resource-ids` parameter with the IDs of the storage system resources that you want information about.

4. Run the `describe-storage-system-resources` command.

   The following example response returns information that a discovery job collected about two volumes in a storage system.

   Note that the `RecommendationStatus` is `NONE` for each volume. To get AWS storage recommendations, you must run the `generate-recommendations` command before the `describe-storage-system-resources` command. For more information, see Getting recommendations.


```
{
    "ResourceDetails": {
        "NetAppONTAPVolumes": [
            {
                "VolumeName": "vol1",
                "ResourceId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
                "CifsShareCount": 0,
                "SecurityStyle": "unix",
                "SvmUuid": "a1b2c3d4-5678-90ab-cdef-EXAMPLEaaaaa",
                "SvmName": "my-svm",
                "CapacityUsed": 409600,
                "CapacityProvisioned": 1099511627776,
                "LogicalCapacityUsed": 409600,
                "NfsExported": true,
                "SnapshotCapacityUsed": 573440,
                "MaxP95Performance": {
                    "IopsRead": 251.0,
                    "IopsWrite": 44.0,
                    "IopsOther": 17.0,
                    "IopsTotal": 345.0,
                    "ThroughputRead": 2.06,
                    "ThroughputWrite": 0.88,
                    "ThroughputOther": 0.11,
                    "ThroughputTotal": 2.17,
                    "LatencyRead": 0.06,
                    "LatencyWrite": 0.07,
                    "LatencyOther": 0.13
                },
                "Recommendations": [],
                "RecommendationStatus": "NONE"
            },
            {
                "VolumeName": "root_vol",
```

```
                "ResourceId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
                "CifsShareCount": 0,
                "SecurityStyle": "unix",
                "SvmUuid": "a1b2c3d4-5678-90ab-cdef-EXAMPLEaaaaa",
                "SvmName": "my-svm",
                "CapacityUsed": 462848,
                "CapacityProvisioned": 1073741824,
                "LogicalCapacityUsed": 462848,
                "NfsExported": true,
                "SnapshotCapacityUsed": 421888,
                "MaxP95Performance": {
                    "IopsRead": 261.0,
                    "IopsWrite": 53.0,
                    "IopsOther": 23.0,
                    "IopsTotal": 360.0,
                    "ThroughputRead": 10.0,
                    "ThroughputWrite": 2.0,
                    "ThroughputOther": 4.0,
                    "ThroughputTotal": 12.0,
                    "LatencyRead": 0.25,
                    "LatencyWrite": 0.3,
                    "LatencyOther": 0.55
                },
                "Recommendations": [],
                "RecommendationStatus": "NONE"
            }
        ]
    }
}
```


Getting recommendations from AWS DataSync Discovery

After AWS DataSync Discovery collects information about your on-premises storage system, it can recommend moving your data on a per-resource basis to one or more of the following AWS storage services:

- Amazon FSx for NetApp ONTAP
- Amazon Elastic File System (Amazon EFS)
- Amazon FSx for Windows File Server

What's included in the recommendations?

DataSync Discovery recommendations include storage configurations and cost estimates to help you choose the AWS storage service that works for your data.

AWS storage configuration

DataSync Discovery provides information about how you might want to configure a recommended AWS storage service. The storage configuration is designed to optimize costs while helping meet storage performance and capacity needs based on information that's collected during a discovery job.

The storage configuration is only an approximation and might not account for all capabilities provided by an AWS storage service. For more information, see What's not included in the recommendations?

Estimated cost

DataSync Discovery provides an estimated monthly cost for each AWS storage service that it recommends. The cost is based on standard AWS pricing and provides only an estimate of your AWS fees. It does not include any taxes that might apply. Your actual fees depend on a variety of factors, including your usage of AWS services.

The estimated cost also doesn't include the one-time or periodic fees for migrating your data to AWS.

What's not included in the recommendations?

DataSync Discovery won't recommend an AWS storage service that doesn't meet your storage configuration needs.

Additionally, the following AWS storage capabilities currently aren't accounted for when recommendations are determined:

- **Amazon FSx for NetApp ONTAP** – Single-AZ deployments and backup storage
- **Amazon EFS** – EFS One Zone storage classes and backup storage
- **Amazon FSx for Windows File Server** – Single-AZ deployments and backup storage

Getting recommendations

You can generate AWS storage recommendations after your discovery job completes, when you stop the job, and even sometimes if the job completes but had some issues collecting information from your storage system.

There might be situations when you can't get recommendations (for example, if your discovery job fails). For more information, see Recommendation statuses.

> **Tip**
>
> Before starting your migration to AWS, review the DataSync Discovery recommendations with your AWS account team.

Using the AWS CLI

1. Copy the following `describe-discovery-job` command:

   ```
   aws datasync describe-discovery-job --discovery-job-arn "your-discovery-job-arn"
   ```

2. For the `--discovery-job-arn` parameter, specify the Amazon Resource Name (ARN) of the discovery job that you ran on the storage system.
3. Run the `describe-discovery-job` command.

   If your response includes a `Status` that isn't `FAILED`, you can continue. If you see `FAILED`, you must run another discovery job on your storage system to try to generate recommendations.
4. If your discovery job completed successfully, skip this step. Otherwise, do the following to manually generate recommendations:

   a. Copy the following `generate-recommendations` command:

   ```
   aws datasync generate-recommendations \
     --discovery-job-arn "your-discovery-job-arn" \
     --resource-type cluster-svm-volume \
     --resource-ids storage-resource-UUIDs
   ```

   b. For the `--discovery-job-arn` parameter, specify the ARN of the same discovery job that you specified in Step 2.

c. For the `--resource-type` parameter, specify `CLUSTER`, `SVM`, or `RESOURCE` depending on the kind of resource you want recommendations on.

d. For the `--resource-ids` parameter, specify universally unique identifiers (UUIDs) of the resources that you want recommendations on.

e. Run the `generate-recommendations` command.

f. Wait until the `RecommendationStatus` element in the response has a `COMPLETED` status, then move to the next step.

5. Copy the following `describe-storage-system-resources` command:

```
aws datasync describe-storage-system-resources \
  --discovery-job-arn "your-discovery-job-arn" \
  --resource-type cluster-svm-volume
```

6. Specify the following parameters in the command:

- `--discovery-job-arn` – Specify the ARN of the same discovery job that you specified in Step 2.
- `--resource-type` – Specify the resource type you generated recommendations on (for example, `VOLUME`).

7. Run the `describe-storage-system-resources` command.

> **Note**
>
> In the response, if you don't see `COMPLETED` for `RecommendationStatus`, check the recommendation statuses for more information. You may need to retry generating recommendations.

In this example response, the `Recommendations` element suggests a couple AWS storage services where you can migrate a specific volume, how you might configure the service, and estimated monthly AWS storage costs.

```
{
    "Recommendations": [{
            "StorageType": "fsxOntap",
            "StorageConfiguration": {
                "StorageCapacityGB": "1024",
```

```
                "ProvisionedIOpsMode": "AUTOMATIC",
                "CapacityPoolGB": "0",
                "TotalIOps": "0",
                "DeploymentType": "Multi-AZ",
                "ThroughputCapacity": "128"
            },
            "EstimatedMonthlyStorageCost": "410.0"
        },
        {
            "StorageType": "efs",
            "StorageConfiguration": {
                "InfrequentAccessStorageGB": "1",
                "StandardStorageGB": "1",
                "InfrequentAccessRequests": "0",
                "ProvisionedThroughputMBps": "0",
                "PerformanceMode": "General Purpose",
                "ThroughputMode": "Bursting"
            },
            "EstimatedMonthlyStorageCost": "1.0"
        }
    ],
    "RecommendationStatus": "COMPLETED"
}
```


AWS DataSync Discovery statuses

You can check the status of your discovery jobs and whether AWS DataSync Discovery can provide storage recommendations for your AWS migrations.

Discovery job statuses

Use the following table to understand what's going on with your discovery job.

API status	Description
RUNNING	Your discovery job is running. The job collects data about your on-premises storage system for the duration that you specified.
WARNING	Your discovery job has encountered errors and currently can't collect data. Review the

API status	Description
	Amazon CloudWatch logs and address these issues within 12 hours, or the job will be terminated.
`STOPPED`	You stopped your discovery job before the job was expected to finish.
`COMPLETED`	Your discovery job successfully collected all data from your on-premises storage system.
`COMPLETED_WITH_ISSUES`	There were times during the discovery job when DataSync Discovery couldn't collect data. For details, see your CloudWatch logs.
`TERMINATED`	Your discovery job was canceled because of unresolved issues and some data wasn't collected. For details, see your CloudWatch logs.
`FAILED`	Your discovery job encountered issues and couldn't collect data from your on-premis es storage system. For details, see your CloudWatch logs.

Recommendation statuses

Use the following table to understand whether DataSync Discovery recommendations for a specific on-premises storage resource are ready to view.

API status	Description
`NONE`	You can't generate recommendations yet. Try generating recommendations when your discovery job completes.

API status	Description
NONE	Your discovery job collected enough data for DataSync Discovery to provide recommend ations. You may be able to generate recommendations if you stopped the discovery job early or the job completed but had issues with data collection.
IN_PROGRESS	DataSync Discovery is working on your recommendations. How long this takes depends on how many resources you're generating recommendations for. If you're using the console, it may take a few minutes to generate recommendations for a storage resource.
COMPLETED	You can view your recommendations.
FAILED	DataSync Discovery couldn't generate recommendations. You can review your CloudWatch logs to identify the issue and try generating the recommendations again.
NONE	Recommendations aren't available. You may see this status for a failed discovery job or issue with the storage resource.
COMPLETED	DataSync Discovery currently doesn't support an AWS storage service that meets the needs of the storage resource.

Monitoring your AWS DataSync transfers

Monitoring is important for maintaining the reliability and performance of your AWS DataSync transfer activities. We recommend that you collect monitoring data so that you can more easily debug errors if one occurs. Before you start monitoring DataSync, however, create a monitoring plan that includes answers to the following questions:

- What are your monitoring goals?
- What resources will you monitor?
- How often will you monitor these resources?
- What monitoring tools will you use?
- Who will perform the monitoring tasks?
- Who should be notified when something goes wrong?

AWS provides various services and tools for monitoring DataSync. You can configure some of these to do the monitoring for you, but some require manual intervention. We recommend that you automate monitoring tasks as much as possible.

Topics

Understanding data transfer performance counters

When you start a task, AWS DataSync provides counters to help track your data transfer's performance and progress.

Use the following information to understand what each counter represents. You can view these counters in the DataSync console or a DescribeTaskExecution response. Some counters aren't available with every task mode.

Console	`DescribeTaskExecution`	Task mode support	Description
–	`BytesWritten`	Enhanced, Basic	The number of logical bytes that DataSync actually writes to the destination location.
Data throughput	–	Enhanced, Basic	The rate at which DataSync writes logical bytes to the destination location. If you're using DescribeTaskExecution, how you calculate this counter depends on your task mode: • **Enhanced mode**: Divide `BytesWritten` by `TotalDuration` • **Basic mode**: Divide `BytesWritten` by `TransferDuration`
Data transferred	`BytesTransferred`	Enhanced, Basic	The number of bytes that DataSync sends to the network before compression

Console	DescribeTaskExecution	Task mode support	Description
			(if compression is possible). For the number of bytes transferred over the network, see the **Network throughput** (in console) or `BytesCompressed` (in DescribeTaskExecution) counter.
Deleted from destination	`FilesDeleted`	Basic	The number of files, objects, and directories that DataSync actually deletes in your destination location. If you don't configure your task to delete data in the destination that isn't in the source: • **Deleted from destination** doesn't display in the console. • `FilesDeleted` always shows a value of `0`.

Console	DescribeTaskExecution	Task mode support	Description
Deleted from destination	FilesDeleted , FoldersDeleted	Enhanced	The number of files or objects, and directories that DataSync actually deletes in your destination location. If you don't configure your task to delete data in the destination that isn't in the source: • **Deleted from destination** doesn't display in the console. • FilesDeleted and FoldersDeleted always shows a value of 0.
–	EstimatedBytesToTransfer	Enhanced, Basic	The number of logical bytes that DataSync expects to write to the destination location.

Console	DescribeTaskExecution	Task mode support	Description
–	EstimatedFilesToDelete	Basic	The number of files, objects, and directories that DataSync expects to delete in your destination location. If you don't configure your task to delete data in the destination that isn't in the source, the value is always 0.
–	EstimatedFilesToDelete ,EstimatedFoldersToDelete	Enhanced	The number of files or objects, and directories that DataSync expects to delete in your destination location. If you don't configure your task to delete data in the destination that isn't in the source, the value is always 0.

Console	DescribeTaskExecution	Task mode support	Description
–	EstimatedFilesToTransfer	Basic	The number of files, objects, and directories that DataSync expects to transfer over the network. This value is calculated while DataSync prepares the transfer. How this gets calculated depends primarily on the transfer mode you're using: • **If transfer mode is set to transfer only data that has changed**: The calculation is based on comparing the content of the source and destination locations and determining the difference that needs to be transferred. The difference can include: • Anything that's added or

Console	DescribeTaskExecution	Task mode support	Description
			modified at the source location. • Anything that's in both locations and modified at the destination after an initial transfer (unless you configure your task to not overwrite data in the destination). • The number of items that DataSync expects to delete (if you configure your task to delete data in the destination). • **If transfer mode is set to transfer all data**: The calculation is based only on the items that DataSync finds at the source location.

Console	DescribeTaskExecution	Task mode support	Description
–	EstimatedFilesToTransfer , EstimatedFoldersToTransfer	Enhanced	The number of files or objects, and directories that DataSync expects to transfer over the network. This value is calculated while DataSync prepares the transfer. How this gets calculated depends primarily on the transfer mode you're using: • **If transfer mode is set to transfer only data that has changed**: The calculation is based on comparing the content of the source and destination locations and determining the difference that needs to be transferred. The difference can include: • Anything that's added or

Console	DescribeTaskExecution	Task mode support	Description
			modified at the source location. • Anything that's in both locations and modified at the destination after an initial transfer (unless you configure your task to not overwrite data in the destination). • **If transfer mode is set to transfer all data**: The calculation is based only on the items that DataSync finds at the source location.

Console	`DescribeTaskExecution`	Task mode support	Description
File throughput	–	Enhanced, Basic	The rate at which DataSync transfers files, objects, and directories over the network. If you're using DescribeTaskExecution, how you calculate this counter depends on your task mode: • **Enhanced mode**: Divide `FilesTransferred` by `TotalDuration` • **Basic mode**: Divide `FilesTransferred` by `TransferDuration`

Console	DescribeTaskExecution	Task mode support	Description
–	FilesFailed , FoldersFailed	Enhanced	The number of files or objects, and directories that DataSync fails to prepare, transfer, verify, and delete during your task execution. If there are failures, you can see these alongside the **Prepared**, **Transferred**, **Skipped**, and **Deleted from destination** console counters, respectively.

Console	DescribeTaskExecution	Task mode support	Description
Listed at source	`FilesListed.AtSource` , `FoldersListed.AtSource`	Enhanced	The number of files or objects, and directories that DataSync finds at your source location. • With a manifest, DataSync lists only what's in your manifest (and not everything in your source location). • With an include filter, DataSync lists only what matches the filter at your source location. • With an exclude filter, DataSync lists everything at your source location before applying the filter.

Console	DescribeTaskExecution	Task mode support	Description
–	FilesListed.AtDestinationForDelete , FoldersListed.AtDestinationForDelete	Enhanced	The number of files or objects, and directories that DataSync finds at your destination location. This counter is only applicable if you configure your task to delete data in the destination that isn't in the source.

Console	DescribeTaskExecution	Task mode support	Description
Network throughput*	BytesCompressed	Enhanced, Basic	The number of physical bytes that DataSync transfers over the network after compression (if compression is possible). This number is typically less than **Data transferred** (in console) or BytesTransferred (in DescribeTaskExecution) unless the data isn't compressible. * For Enhanced mode, **Network throughput** doesn't display in the console.

Console	`DescribeTaskExecution`	Task mode support	Description
Percent compressed	–	Enhanced, Basic	The percentage of transfer data that DataSync compressed before sending it over the network. If you're using DescribeTaskExecution, you can calculate this counter with `1 - BytesCompressed / BytesWritten`.

Console	DescribeTaskExecution	Task mode support	Description
Prepared	`FilesPrepared` , `FoldersPrepared`	Enhanced	The number of files or objects, and directories that DataSync will attempt to transfer after comparing your source and destination locations. In the console, this counter can also show you the number of objects that DataSync skips during preparation. For more information, see How DataSync prepares your data transfer. This counter isn't applicable if you configure your task to transfer all data. In that scenario, DataSync copies everything from the source to the destination without comparing differences between locations.

Console	`DescribeTaskExecution`	Task mode support	Description
Processing rate	–	Enhanced, Basic	The rate at which DataSync reads files, objects, and directories at your source location. The processing rate is based on several CloudWatch metrics. The exact metrics depend on the task mode you're using. **Enhanced mode**: • `FilesListedSource` • `FilesPrepared` • `FilesTransferred` • `FilesVerified` **Basic mode:** • `FilesPreparedSource` • `FilesPreparedDestination` • `FilesTransferred` • `FilesVerifiedSource`

Console	DescribeTaskExecution	Task mode support	Description
			• FilesVerifiedDestination
Remaining	–	Basic	The remaining number of files, objects, and directories that DataSync expects to transfer over the network. If you're using DescribeTaskExecution, you can calculate this counter by subtracting FilesTransferred from EstimatedFilesToTransfer.
Skipped*	FilesSkipped	Basic	The number of files, objects, and directories that DataSync skips during your transfer.

Console	DescribeTaskExecution	Task mode support	Description
–	FilesSkipped , FoldersSkipped	Enhanced	The number of files or objects, and directories that DataSync skips during your transfer. **Skipped** items are included in the **Prepared** counter when transferring only the data that has changed or the **Transferred** counter when transferring all data.

Console	DescribeTaskExecution	Task mode support	Description
Transferred	FilesTransferred	Basic	The number of files, objects, and directories that DataSync transfers over the network. This value is updated periodically during your task execution when something is read from the source and sent over the network. If DataSync fails to transfer something, this value can be less than EstimatedFilesToTransfer or EstimatedFoldersToTransfer. In some cases, this value can also be greater than EstimatedFilesToTransfer or EstimatedFoldersToTransfer. This counter is implementation-specific for some location types, so don't use it as an

Console	DescribeTaskExecution	Task mode support	Description
			exact indication of what's transferring or to monitor your task execution.

Console	DescribeTaskExecution	Task mode support	Description
Transferred	FilesTransferred , FoldersTransferred	Enhanced	The number of files or objects, and directories that DataSync transfers over the network. This value is updated periodically during your task execution when something is read from the source and sent over the network. If DataSync fails to transfer something , this value can be less than EstimatedFilesToTransfer or EstimatedFoldersToTransfer . In some cases, this value can also be greater than EstimatedFilesToTransfer or EstimatedFoldersToTransfer . This counter is implementation-specific for some location types, so don't use it as an

Console	DescribeTaskExecution	Task mode support	Description
			exact indication of what's transferring or to monitor your task execution.
Verified	FilesVerified	Basic	The number of files, objects, and directories that DataSync verifies during your transfer. When you configure your task to verify only transferred data, DataSync doesn't verify directories in some situations or files or objects that fail to transfer.
Verified	FilesVerified , FoldersVerified	Enhanced	The number of files or objects, and directories that DataSync verifies during your transfer.

Monitoring data transfers with Amazon CloudWatch metrics

Amazon CloudWatch provides metrics to track DataSync transfer performance and troubleshoot issues with your transfer task.

You can monitor AWS DataSync transfer performance by using Amazon CloudWatch metrics. DataSync metrics are automatically sent to CloudWatch in 5-minute intervals (regardless of how you configure logging). The metrics are retained for a period of 15 months.

To see CloudWatch metrics for DataSync, you can use the following tools:

- The CloudWatch console
- The CloudWatch CLI
- The CloudWatch API
- The DataSync console (on the task execution's details page)

For more information, see the *Amazon CloudWatch User Guide*.

CloudWatch metrics for DataSync

DataSync metrics use the `aws/datasync` namespace and provide metrics for the following dimensions:

- **AgentId** – The unique ID of the agent (if your task uses an agent).
- **TaskId** – The unique ID of the task. It takes the form of `task-01234567890abcdef`.

The `aws/datasync` namespace includes the following metrics. Some metrics aren't available with every task mode.

CloudWatch metric	Task mode support	Description
`BytesCompressed`	Basic	The number of physical bytes that DataSync transfers over the network after compression (if compression is possible). This number is typically less than `BytesTransferred` unless the data isn't compressible. Unit: Bytes
`BytesPreparedDestination`	Basic	The number of logical bytes that DataSync prepares at the destination location. Unit: Bytes
`BytesPreparedSource`	Basic	The number of logical bytes that DataSync prepares at the source location.

CloudWatch metric	Task mode support	Description
		Unit: Bytes
BytesTransferred	Basic	The number of bytes that DataSync sends to the network before compression (if compression is possible). For the number of bytes transferred over the network, see the BytesCompressed metric. Unit: Bytes
BytesVerifiedDestination	Basic	The number of logical bytes that DataSync verifies at the destination location. Unit: Bytes
BytesVerifiedSource	Basic	The number of logical bytes that DataSync verifies at the source location. Units: Bytes
BytesWritten	Enhanced, Basic	The number of logical bytes that DataSync writes to the destination location. Unit: Bytes
FilesDeleted	Enhanced, Basic	The number of files, objects, and directories that DataSync deletes in your destination location. If you don't configure your task to delete data in the destination that isn't in the source, the value is always 0. Unit: Count
FilesListedSource	Enhanced	The number of objects that DataSync finds at your source location. Unit: Count

CloudWatch metric	Task mode support	Description
`FilesPrepared`	Enhanced	The number of objects that DataSync will attempt to transfer after comparing your source and destination locations. For more information, see How DataSync prepares your data transfer. This metric isn't applicable if you configure your task to transfer all data. In that scenario, DataSync copies everything from the source to the destination without comparing differences between the locations. Unit: Count
`FilesPreparedDestination`	Basic	The number of files, objects, and directories that DataSync prepares at the destination location. Unit: Count
`FilesPreparedSource`	Basic	The number of files, objects, and directories that DataSync prepares at the source location. Unit: Count
`FilesSkipped`	Basic	The number of files, objects, and directories that DataSync skips during your transfer. Unit: Count

CloudWatch metric	Task mode support	Description
`FilesTransferred`	Enhanced, Basic	The number of files, objects, and directories that DataSync transfers over the network. This value is updated periodically during the task execution when something is read from the source and sent over the network. **Note** This value can be less than `EstimatedFilesToTransfer` in a DescribeTaskExecution response if DataSync fails to transfer something. In some cases, this value can also be greater than `EstimatedFilesToTransfer`. This metric is implementation-specific for some location types, so don't use it as an exact indication of what transferred or to monitor your task execution. Unit: Count
`FilesVerified`	Enhanced	The number of objects that DataSync verifies during your transfer. Unit: Count
`FilesVerifiedDestination`	Basic	The number of files, objects, and directories that DataSync verifies at the destination location. Unit: Count
`FilesVerifiedSource`	Basic	The number of files, objects, and directories that DataSync verifies at the source location. Unit: Count

Monitoring your data transfers with task reports

Task reports provide detailed information about what AWS DataSync attempts to transfer, skip, verify, and delete during a task execution. For more information, see How DataSync transfers files, objects, and directories.

Task reports are generated in JSON format. You can customize the level of detail in your reports:

- Summary only task reports give you the necessary details about your task execution, such as how many files transferred and whether DataSync could verify the data integrity of those files.
- Standard task reports include a summary plus detailed reports that list each file, object, or folder that DataSync attempts to transfer, skip, verify, and delete. With a standard task report, you can also specify the report level to show only the task execution's errors or its successes and errors.

Use cases

Here are some situations where task reports can help you monitor and audit your data transfers:

- When migrating millions of files, quickly identify files that DataSync has issues transferring.
- Verify chain-of-custody processes for your files.

Summary only task reports

A report that's only a summary of a task execution includes the following details:

- The AWS account that ran the task execution
- The source and destination locations
- The total number of files, objects, and folders that were skipped, transferred, verified, and deleted
- The total bytes (logical and physical) that were transferred
- If the task execution was completed, canceled, or encountered an error
- The start and end times (including the total time of the transfer)
- The task's settings (such as bandwidth limits, data integrity verification, and other options for your DataSync transfer)

Standard task reports

A standard task report includes a summary of your task execution plus detailed reports of what DataSync attempts to transfer, skip, verify, and delete.

Topics

Report level

With standard task reports, you can choose one of the following report levels:

- Errors only
- Successes and errors (essentially a list of everything that happened during your task execution)

For example, you might want to see which files DataSync skipped successfully during your transfer and which ones it didn't. Files that DataSync skipped successfully might be ones that you purposely want DataSync to exclude because they already exist in your destination location. However, a skipped error for instance might indicate that DataSync doesn't have the right permissions to read a file.

Transferred reports

A list of files, objects, and directories that DataSync attempted to transfer during your task execution. A transferred report includes the following details:

- The paths for the transferred data
- What was transferred (content, metadata, or both)
- The metadata, which includes the data type, content size (objects and files only), and more
- The time when an item was transferred
- The object version (if the destination is an Amazon S3 bucket that has versioning enabled)

- If something was overwritten in the destination
- Whether an item transferred successfully

> **Note**
>
> When moving data between S3 buckets, the prefix that you specify in your source location can show up in your report (or in Amazon CloudWatch logs), even if that prefix doesn't exist as an object in your destination location. (In the DataSync console, you might also notice this prefix showing up as skipped or verified data.)

Skipped reports

A list of files, objects, and directories that DataSync finds in your source location but didn't attempt to transfer. The reasons DataSync skips data can depend on several factors, such as how you configure your task and storage system permissions. Here are some examples:

- There's a file that exists in your source and destination locations. The file in the source hasn't been modified since the previous task execution. Since you're only transferring data that has changed, DataSync doesn't transfer that file next time you run your task.
- An object that exists in both of your locations changes in your source. When you run your task, DataSync skips this object in your destination because your task doesn't overwrite data in the destination.
- DataSync skips an object in your source that's using an archival storage class and isn't restored. You must restore an archived object for DataSync to read it.
- DataSync skips a file, object, or directory in your source location because it can't read it. If this happens and isn't expected, check your storage's access permissions and make sure that DataSync can read what was skipped.

A skipped report includes the following details:

- The paths for skipped data
- The time when an item was skipped
- The reason it was skipped
- Whether an item was skipped successfully

> **Note**
>
> Skipped reports can be large when they include successes and errors, you configure your task to transfer only the data that has changed, and source data already exists in the destination.

Verified reports

A list of files, objects, and directories that DataSync attempted to verify the integrity of during your task execution. A verified data report includes the following details:

- The paths for verified data
- The time when an item was verified
- The reason for the verification error (if any)
- The source and destination SHA256 checksums (files only)
- Whether an item was successfully verified

Note the following about verified reports:

- When you configure your task to verify only transferred data, DataSync doesn't verify directories in some situations or files or objects that fail to transfer. In either case, DataSync doesn't include unverified data in this report.
- If you're using Enhanced mode, verification might take longer than usual if you're transferring large objects.

Deleted reports

A list of files, directories, and objects that were deleted during your task execution. DataSync generates this report only if you configure your task to delete data in the destination location that isn't in the source. A deleted data report includes the following details:

- The paths for deleted data
- Whether an item was successfully deleted
- The time when an item was deleted

Example task reports

The level of detail in your task report is up to you. Here are some example transferred data reports with the following configuration:

- **Report type** – Standard
- **Report level** – Successes and errors

> **Note**
>
> Reports use the ISO-8601 standard for the timestamp format. Times are in UTC and measured in nanoseconds. This behavior differs from how some other task report metrics are measured. For example, task execution details, such as `TransferDuration` and `VerifyDuration`, are measured in milliseconds.

Enhanced mode task reports use a somewhat different schema than Basic mode task reports. The following examples can help you know what to expect from your reports depending on the task mode you use.

Example transferred data reports with success status

The following reports show successful transfers for an object named `object1.txt`.

Enhanced mode

```
{
    "TaskExecutionId": "exec-abcdefgh12345678",
    "Transferred": [{
        "RelativePath": "object1.txt",
        "SourceMetadata": {
            "Type": "Object",
            "ContentSize": 6,
            "LastModified": "2024-10-04T14:40:55Z",
            "SystemMetadata": {
                "ContentType": "binary/octet-stream",
                "ETag": "\"9b2d7e1f8054c3a2041905d0378e6f14\"",
                "ServerSideEncryption": "AES256"
            },
            "UserMetadata": {},
```

```
            "Tags": []
        },
        "Overwrite": "False",
        "DstS3VersionId": "jtqRtX3jN4J2G8k0sFSGYK1f35KqpAVP",
        "TransferTimestamp": "2024-10-04T14:48:39.748862183Z",
        "TransferType": "CONTENT_AND_METADATA",
        "TransferStatus": "SUCCESS"
    }]
}
```

Basic mode

```
{
    "TaskExecutionId": "exec-abcdefgh12345678",
    "Transferred": [{
        "RelativePath": "/object1.txt",
        "SrcMetadata": {
            "Type": "Regular",
            "ContentSize": 6,
            "Mtime": "2022-01-07T16:59:26.136114671Z",
            "Atime": "2022-01-07T16:59:26.136114671Z",
            "Uid": 0,
            "Gid": 0,
            "Mode": "0644"
        },
        "Overwrite": "False",
        "DstS3VersionId": "jtqRtX3jN4J2G8k0sFSGYK1f35KqpAVP",
        "TransferTimestamp": "2022-01-07T16:59:45.747270957Z",
        "TransferType": "CONTENT_AND_METADATA",
        "TransferStatus": "SUCCESS"
    }]
}
```

Example transferred data reports with error status

The following reports provide examples of when DataSync can't transfer an object named `object1.txt`.

Enhanced mode

This report shows that DataSync can't access an object named `object1.txt` because of an AWS KMS permissions issue. (If you get an error like this, see Accessing S3 buckets using server-side encryption.)

```
{
    "TaskExecutionId": "exec-abcdefgh12345678",
    "Transferred": [{
        "RelativePath": "object1.txt",
        "SourceMetadata": {
            "Type": "Object",
            "ContentSize": 6,
            "LastModified": "2022-10-07T20:48:32Z",
            "SystemMetadata": {
                "ContentType": "binary/octet-stream",
                "ETag": "\"3a7c0b2f1d9e5c4a6f8b2e0d1c9f7a3b2\"",
                "ServerSideEncryption": "AES256"
            },
            "UserMetadata": {},
            "Tags": []
        },
        "Overwrite": "False",
        "TransferTimestamp": "2022-10-09T16:05:11.134040717Z",
        "TransferType": "CONTENT_AND_METADATA",
        "TransferStatus": "FAILED",
        "ErrorCode": "AccessDenied",
        "ErrorDetail": "User: arn:aws:sts::111222333444:assumed-role/
AWSDataSyncS3Bucket/AwsSync-loc-0b3017fc4ba4a2d8d is not authorized
 to perform: kms:GenerateDataKey on resource: arn:aws:kms:us-
east-1:111222333444:key/1111aaaa-22bb-33cc-44d-5555eeee6666 because no identity-
based policy allows the kms:GenerateDataKey action"
    }]
}
```

Basic mode

This report shows that an object named `object1.txt` didn't transfer because of an S3 bucket permissions issue. (If you get an error like this, see Providing DataSync access to S3 buckets.)

```
{
    "TaskExecutionId": "exec-abcdefgh12345678",
    "Transferred": [{
        "RelativePath": "/object1.txt",
        "SrcMetadata": {
            "Type": "Regular",
            "ContentSize": 6,
            "Mtime": "2022-01-07T16:59:26.136114671Z",
```

```
            "Atime": "2022-01-07T16:59:26.136114671Z",
            "Uid": 0,
            "Gid": 0,
            "Mode": "0644"
        },
        "Overwrite": "False",
        "DstS3VersionId": "jtqRtX3jN4J2G8k0sFSGYK1f35KqpAVP",
        "TransferTimestamp": "2022-01-07T16:59:45.747270957Z",
        "TransferType": "CONTENT_AND_METADATA",
        "TransferStatus": "FAILED",
        "FailureReason": "S3 Get Object Failed",
        "FailureCode": 40974
    }]
}
```

Limitations

- Individual task reports can't exceed 5 MB. If you're copying a large number of files, your task report might be split into multiple reports.
- There are situations when creating task reports can affect the performance of your data transfer. For example, you might notice this when your network connection has high latency and the files you're transferring are small or you're copying only metadata changes.

Creating your DataSync task reports

AWS DataSync task reports can be only a summary of your task execution or a set of detailed reports about what DataSync attempts to transfer, skip, verify, and delete.

Prerequisites

Before you can create a task report, you must do the following.

Topics

- Create an S3 bucket for your task reports
- Allow DataSync to upload task reports to your S3 bucket

Create an S3 bucket for your task reports

If you don't already have one, create an S3 bucket where DataSync can upload your task report. Reports are stored in the S3 Standard storage class.

We recommend the following for this bucket:

- If you're planning to transfer data to an S3 bucket, don't use the same bucket for your task report if you disable the **Keep deleted files** option. Otherwise, DataSync will delete any previous task reports each time you execute a task since those reports don't exist in your source location.
- To avoid a complex access permissions setup, make sure that your task report bucket is in the same AWS account and Region as your DataSync transfer task.

Allow DataSync to upload task reports to your S3 bucket

You must configure an AWS Identity and Access Management (IAM) role that allows DataSync to upload a task report to your S3 bucket.

In the DataSync console, you can create an IAM role that in most cases automatically includes the permissions to upload a task report to your bucket. Keep in mind that this automatically generated role might not meet your needs from a least-privilege standpoint. This role also won't work if your bucket is encrypted with a customer managed AWS Key Management Service (AWS KMS) key (SSE-KMS). In these cases, you can create the role manually as long as the role does at least the following:

- Prevents the cross-service confused deputy problem in the role's trusted entity.

  The following full example shows how you can use the `aws:SourceArn` and `aws:SourceAccount` global condition context keys to prevent the confused deputy problem with DataSync.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "datasync.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
```

```
            "Condition": {
                "StringEquals": {
                "aws:SourceAccount": "123456789012"
                },
                "ArnLike": {
                "aws:SourceArn": "arn:aws:datasync:us-east-1:123456789012:*"
                }
            }
        }
    ]
}
```

- Allows DataSync to upload a task report to your S3 bucket.

  The following example does this by including the `s3:PutObject` action only for a specific prefix (`reports/`) in your bucket.

```
{
        "Version": "2012-10-17",
        "Statement": [{
            "Action": [
                "s3:PutObject"
            ],
            "Effect": "Allow",
            "Resource": "arn:aws:s3:::your-task-reports-bucket/reports/*"
        }]
}
```

- If your S3 bucket is encrypted with a customer managed SSE-KMS key, the key's policy must include the IAM role that DataSync uses to access the bucket.

  For more information, see Accessing S3 buckets using server-side encryption.

Creating a summary only task report

You can configure a task report that includes a summary only when creating your DataSync task, starting your task, or updating your task.

The following steps show how to configure a summary only task report when creating a task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.

2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. Scroll down to the **Task report** section. For **Report type**, choose **Summary only**.
5. For **S3 bucket for reports**, choose an S3 bucket where you want DataSync to upload your task report.

   > **Tip**
   >
   > If you're planning to transfer data to an S3 bucket, don't use the same bucket for your task report if you disable the **Keep deleted files** option. Otherwise, DataSync will delete any previous task reports each time you execute a task since those reports don't exist in your source location.

6. For **Folder**, enter a prefix to use for your task report when DataSync uploads the report to your S3 bucket (for example, **`reports/`**).

   Make sure to include the appropriate delimiter character at the end of your prefix. This character is usually a forward slash (/). For more information, see Organizing objects by using prefixes in the *Amazon S3 User Guide*.
7. For **IAM role**, do one of the following:

   - Choose **Autogenerate** to have DataSync automatically create an IAM role with the permissions that are required to access the S3 bucket.

     If DataSync previously created an IAM role for this S3 bucket, that role is chosen by default.
   - Choose a custom IAM role that you created.

     In some cases, you might need to create the role yourself. For more information, see Allow DataSync to upload task reports to your S3 bucket.

     > **Important**
     >
     > If your S3 bucket is encrypted with a customer managed SSE-KMS key, the key's policy must include the IAM role that DataSync uses to access the bucket.

For more information, see Accessing S3 buckets using server-side encryption.

8. Finish creating your task, and then start the task to begin transferring your data.

When your transfer is complete, you can view your task report.

Using the AWS CLI

1. Copy the following `create-task` AWS Command Line Interface (AWS CLI) command:

```
aws datasync create-task \
  --source-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh \
  --destination-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-abcdefgh12345678 \
  --task-report-config '{
    "Destination":{
      "S3":{
        "Subdirectory":"reports/",
        "S3BucketArn":"arn:aws:s3:::your-task-reports-bucket",
        "BucketAccessRoleArn":"arn:aws:iam::123456789012:role/bucket-iam-role"
        }
    },
    "OutputType":"SUMMARY_ONLY"
  }'
```

2. For the `--source-location-arn` parameter, specify the Amazon Resource Name (ARN) of the source location in your transfer. Replace *us-east-1* with the appropriate AWS Region, replace *123456789012* with the appropriate AWS account number, and replace *12345678abcdefgh* with the appropriate source location ID.
3. For the `--destination-location-arn` parameter, specify the ARN of the destination location in your transfer. Replace *us-east-1* with the appropriate AWS Region, replace *123456789012* with the appropriate AWS account number, and replace *abcdefgh12345678* with the appropriate destination location ID.
4. For the `--task-report-config` parameter, do the following:

   - `Subdirectory` – Replace *reports/* with the prefix in your S3 bucket where you want DataSync to upload your task reports.

Make sure to include the appropriate delimiter character at the end of your prefix. This character is usually a forward slash (/). For more information, see Organizing objects by using prefixes in the *Amazon S3 User Guide*.

- `S3BucketArn` – Specify the ARN of the S3 bucket where you want to upload your task report.

  > **Tip**
  >
  > If you're planning to transfer data to an S3 bucket, don't use the same bucket for your task report if you disable the **Keep deleted files** option. Otherwise, DataSync will delete any previous task reports each time you execute a task since those reports don't exist in your source location.

- `BucketAccessRoleArn` – Specify the IAM role that allows DataSync to upload a task report to your S3 bucket.

  For more information, see Allow DataSync to upload task reports to your S3 bucket.

  > **Important**
  >
  > If your S3 bucket is encrypted with a customer managed SSE-KMS key, the key's policy must include the IAM role that DataSync uses to access the bucket.
  > For more information, see Accessing S3 buckets using server-side encryption.

- `OutputType` – Specify `SUMMARY_ONLY`.

  For more information, see Summary only task reports.

5. Run the `create-task` command to create your task.

   You get a response like the following that shows you the ARN of the task that you created. You will need this ARN to run the `start-task-execution` command.

   ```
   {
       "TaskArn": "arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh"
   }
   ```

6. Copy the following `start-task-execution` command.

```
aws datasync-task-report start-task-execution \
  --task-arn arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh
```

7. For the `--task-arn` parameter, specify the ARN of the task that you're starting. Use the ARN that you received from running the `create-task` command.
8. Run the `start-task-execution` command.

When your transfer is complete, you can view your task report.

Creating a standard task report

You can configure a standard task report when creating your DataSync task, starting your task, or updating your task.

The following steps show how to configure a standard task report when creating a task.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. Scroll down to the **Task report** section. For **Report type**, choose **Standard report**.
5. For **Report level**, choose one of the following:

   - **Errors only** – Your task report includes only issues with what DataSync tried to transfer, skip, verify, and delete.
   - **Successes and errors** – Your task report includes what DataSync successfully transferred, skipped, verified, and deleted and what it didn't.
   - **Custom** – Allows you to choose whether you want to see errors only or successes and errors for specific aspects of your task report.

     For example, you can choose **Successes and errors** for the transferred files list but **Errors only** for the rest of the report.

6. If you're transferring to an S3 bucket that uses object versioning, keep **Include Amazon S3 object versions** selected if you want your report to include the new version for each transferred object.
7. For **S3 bucket for reports**, choose an S3 bucket where you want DataSync to upload your task report.

   > **Tip**
   >
   > If you're planning to transfer data to an S3 bucket, don't use the same bucket for your task report if you disable the **Keep deleted files** option. Otherwise, DataSync will delete any previous task reports each time you execute a task since those reports don't exist in your source location.

8. For **Folder**, enter a prefix to use for your task report when DataSync uploads the report to your S3 bucket (for example, **`reports/`**). Make sure to include the appropriate delimiter character at the end of your prefix. This character is usually a forward slash (/). For more information, see Organizing objects by using prefixes in the *Amazon S3 User Guide*.
9. For **IAM role**, do one of the following:

   - Choose **Autogenerate** to have DataSync automatically create an IAM role with the permissions that are required to access the S3 bucket.

     If DataSync previously created an IAM role for this S3 bucket, that role is chosen by default.
   - Choose a custom IAM role that you created.

     In some cases, you might need to create the role yourself. For more information, see Allow DataSync to upload task reports to your S3 bucket.

     > **Important**
     >
     > If your S3 bucket is encrypted with a customer managed SSE-KMS key, the key's policy must include the IAM role that DataSync uses to access the bucket. For more information, see Accessing S3 buckets using server-side encryption.

10. Finish creating your task and start the task to begin transferring your data.

When your transfer is complete, you can view your task report.

Using the AWS CLI

1. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-12345678abcdefgh \
  --destination-location-arn arn:aws:datasync:us-east-1:123456789012:location/
loc-abcdefgh12345678 \
  --task-report-config '{
    "Destination":{
      "S3":{
        "Subdirectory":"reports/",
        "S3BucketArn":"arn:aws:s3:::your-task-reports-bucket",
        "BucketAccessRoleArn":"arn:aws:iam::123456789012:role/bucket-iam-role"
        }
    },
    "OutputType":"STANDARD",
    "ReportLevel":"level-of-detail",
    "ObjectVersionIds":"include-or-not"
  }'
```

2. For the `--source-location-arn` parameter, specify the ARN of the source location in your transfer. Replace *us-east-1* with the appropriate AWS Region, replace *123456789012* with the appropriate AWS account number, and replace *12345678abcdefgh* with the appropriate source location ID.
3. For the `--destination-location-arn` parameter, specify the ARN of the destination location in your transfer. Replace *us-east-1* with the appropriate AWS Region, replace *123456789012* with the appropriate AWS account number, and replace *abcdefgh12345678* with the appropriate destination location ID.
4. For the `--task-report-config` parameter, do the following:

   - `Subdirectory` – Replace *reports/* with the prefix in your S3 bucket where you want DataSync to upload your task reports. Make sure to include the appropriate delimiter character at the end of your prefix. This character is usually a forward slash (/). For more information, see Organizing objects by using prefixes in the *Amazon S3 User Guide*.
   - `S3BucketArn` – Specify the ARN of the S3 bucket where you want to upload your task report.

> **Tip**
>
> If you're planning to transfer data to an S3 bucket, don't use the same bucket for your task report if you disable the **Keep deleted files** option. Otherwise, DataSync will delete any previous task reports each time you execute a task since those reports don't exist in your source location.

- `BucketAccessRoleArn` – Specify the IAM role that allows DataSync to upload a task report to your S3 bucket.

  For more information, see Allow DataSync to upload task reports to your S3 bucket.

  > **Important**
  >
  > If your S3 bucket is encrypted with a customer managed SSE-KMS key, the key's policy must include the IAM role that DataSync uses to access the bucket.
  > For more information, see Accessing S3 buckets using server-side encryption.

- `OutputType` – Specify `STANDARD` report.

  For more information, see Standard task reportsTypes of task reports.

- (Optional) `ReportLevel` – Specify whether you want `ERRORS_ONLY` (the default) or `SUCCESSES_AND_ERRORS` in your report.
- (Optional) `ObjectVersionIds` – If you're transferring to an S3 bucket that uses object versioning, specify `NONE` if you don't want to include the new version for each transferred object in the report.

  By default, this option is set to `INCLUDE`.

- (Optional) `Overrides` – Customize the `ReportLevel` of a particular aspect of your report.

  For example, you might want to see `SUCCESSES_AND_ERRORS` for the list of what DataSync deletes in your destination location, but you want `ERRORS_ONLY` for everything else. In this example, you would add the following `Overrides` option to the `--task-report-config` parameter:

```
"Overrides":{
  "Deleted":{
```

```
    "ReportLevel":"SUCCESSES_AND_ERRORS"
  }
}
```

If you don't use `Overrides`, your entire report uses the `ReportLevel` that you specify.

5. Run the `create-task` command to create your task.

   You get a response like the following that shows you the ARN of the task that you created. You will need this ARN to run the `start-task-execution` command.

```
{
    "TaskArn": "arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh"
}
```

6. Copy the following `start-task-execution` command.

```
aws datasync-task-report start-task-execution \
  --task-arn arn:aws:datasync:us-east-1:123456789012:task/task-12345678abcdefgh
```

7. For the `--task-arn` parameter, specify the ARN of the task you're running. Use the ARN that you received from running the `create-task` command.
8. Run the `start-task-execution` command.

When your transfer is complete, you can view your task report.

Viewing your DataSync task reports

DataSync creates task reports for every task execution. When your execution completes, you can find the related task reports in your S3 bucket. Task reports are organized under prefixes that include the IDs of your tasks and their executions.

To help locate task reports in your S3 bucket, use these examples:

- **Summary only task report** – *reports-prefix*/Summary-Reports/*task-id-folder*/*task-execution-id-folder*
- **Standard task report** – *reports-prefix*/Detailed-Reports/*task-id-folder*/*task-execution-id-folder*

Because task reports are in JSON format, you have several options for viewing your reports:

- View a report by using Amazon S3 Select.
- Visualize reports by using AWS services such as AWS Glue, Amazon Athena, and Amazon Quick. For more information about visualizing your task reports, see the AWS Storage Blog.

Monitoring data transfers with Amazon CloudWatch Logs

You can monitor your AWS DataSync transfer by using CloudWatch Logs. We recommend that you configure your task to at least log basic information (such as transfer errors).

Allowing DataSync to upload logs to a CloudWatch log group

To configure logging for your DataSync task, you need a CloudWatch log group that DataSync has permission to send logs to. You set up this access through an AWS Identity and Access Management (IAM) role. How this specifically works depends on your task mode.

Enhanced mode

With Enhanced mode, DataSync automatically sends task logs to a log group named `/aws/datasync`. If that log group doesn't exist in your AWS Region, DataSync creates the log group on your behalf by using an IAM service-linked role when you create your task.

Basic mode

There are a couple ways to set up a CloudWatch log group for a DataSync task using Basic mode. In the console, you can automatically create an IAM role that in most cases includes the permissions that DataSync requires to upload logs. Keep in mind that this automatically generated role might not meet your needs from a least-privilege standpoint.

If you want to use an existing CloudWatch log group or are creating your tasks programmatically, you must create the IAM role yourself.

The following example is an IAM policy that grants these permissions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "DataSyncLogsToCloudWatchLogs",
            "Effect": "Allow",
            "Action": [
```

```
                "logs:PutLogEvents",
                "logs:CreateLogStream"
            ],
            "Principal": {
                "Service": "datasync.amazonaws.com"
            },
            "Condition": {
                "ArnLike": {
                    "aws:SourceArn": [
                    "arn:aws:datasync:us-east-1:444455556666:task/*"
                    ]
                },
                "StringEquals": {
                "aws:SourceAccount": "444455556666"
                }
            },
            "Resource": "arn:aws:logs:us-east-1:444455556666:log-group:*:*"
        }
    ]
}
```

The policy uses `Condition` statements to help ensure that only DataSync tasks from the specified account have access to the specified CloudWatch log group. We recommend using the aws:SourceArn and aws:SourceAccount global condition context keys in these `Condition` statements to protect against the confused deputy problem. For more information, see Cross-service confused deputy prevention.

To specify the DataSync task or tasks, replace *`region`* with the Region code for the AWS Region where the tasks are located (for example, `us-west-2`), and replace *`account-id`* with the AWS account ID of the account that contains the tasks. To specify the CloudWatch log group, replace the same values. You can also modify the `Resource` statement to target specific log groups. For more information about using `SourceArn` and `SourceAccount`, see Global condition keys in the *IAM User Guide*.

To apply the policy, save this policy statement to a file on your local computer. Then run the following AWS CLI command to apply the resource policy. To use this example command, replace *`full-path-to-policy-file`* with the path to the file that contains your policy statement.

```
aws logs put-resource-policy --policy-name trust-datasync --policy-document
 file://full-path-to-policy-file
```

> **Note**
>
> Run this command by using the same AWS account and AWS Region where you activated your DataSync agent.

For more information, see the *Amazon CloudWatch Logs User Guide*.

Configuring logging for your DataSync task

We recommend that you configure at least some level of logging for your DataSync task.

Before you begin

DataSync needs permission to upload logs to a CloudWatch log group. For more information, see Allowing DataSync to upload logs to a CloudWatch log group.

Using the DataSync console

The following instructions describe how to configure CloudWatch logging when creating a task. You also can configure logging when editing a task.

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**, and then choose **Create task**.
3. Configure your task's source and destination locations.

   For more information, see Where can I transfer my data with AWS DataSync?
4. On the **Configure settings** page, choose a task mode and any other options.

   You might be interested in some of the following options:

   - Specify what data to transfer by using a manifest or filters.
   - Configure how to handle file metadata and verify data integrity.
5. For **Log level**, choose one of the following options:

   - **Log basic information such as transfer errors** – Publish logs with only basic information (such as transfer errors).

- **Log all transferred objects and files** – Publish logs for all files or objects that DataSync transfers and performs data-integrity checks on.
- **Don't generate logs**

6. Do one of the following depending on the task mode you're using to create or specify a CloudWatch log group:

   Enhanced mode

   When you choose **Create task**, DataSync automatically uses (or creates) a log group named `/aws/datasync`.

   Basic mode

   For **CloudWatch log group**, specify a log group that DataSync has permission to upload logs to by doing one of the following:

   - Choose **Autogenerate** to automatically create a log group that allows DataSync to upload logs to it.
   - Choose an existing log group in your current AWS Region.

     If you choose an existing log group, make sure that DataSync has permission to upload logs to that log group.

7. Choose **Create task**.

You're ready to start your task.

Using the AWS CLI

1. Copy the following `create-task` command:

```
aws datasync create-task \
  --source-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --destination-location-arn "arn:aws:datasync:us-east-1:account-id:location/location-id" \
  --task-mode "ENHANCED-or-BASIC" \
  --name "task-name" \
  --options '{"LogLevel": "log-level"}' \
  --cloudwatch-log-group-arn "arn:aws:logs:us-east-1:account-id:log-group:log-group-name:*"
```

2. For `--source-location-arn`, specify the Amazon Resource Name (ARN) of your source location.
3. For `--destination-location-arn`, specify the ARN of your destination location.

   If you're transferring across AWS Regions or accounts, make sure that the ARN includes the other Region or account ID.
4. For `--task-mode`, specify `ENHANCED` or `BASIC`.
5. (Recommended) For `--name`, specify a name for your task that you can remember.
6. For `LogLevel`, specify one of the following options:

   - `BASIC` – Publish logs with only basic information (such as transfer errors).
   - `TRANSFER` – Publish logs for all files or objects that DataSync transfers and performs data-integrity checks on.
   - `NONE` – Don't generate logs.
7. For `--cloudwatch-log-group-arn`, specify the ARN of a CloudWatch log group.

   > **Important**
   >
   > If your `--task-mode` is `ENHANCED`, you don't need to specify this option. For more information, see Allowing DataSync to upload logs to a CloudWatch log group.
8. Run the `create-task` command.

   If the command is successful, you get a response that shows you the ARN of the task that you created. For example:

```
{
    "TaskArn": "arn:aws:datasync:us-east-1:111222333444:task/
task-08de6e6697796f026"
}
```

You're ready to start your task.

Using the DataSync API

You can configure CloudWatch logging for your task by using the `CloudWatchLogGroupArn` parameter with any of the following operations:

- CreateTask
- UpdateTask

Viewing DataSync task logs

When you start your task, you can view the task execution's logs by using the CloudWatch console or AWS CLI (among other options). For more information, see the *Amazon CloudWatch Logs User Guide*.

DataSync provides JSON-structured logs for Enhanced mode tasks. Basic mode tasks have unstructured logs. The following examples show how verification errors display in Enhanced mode logs compared to Basic mode logs.

Enhanced mode log example


```
{
    "Action": "VERIFY",
    "Source": {
        "LocationId": "loc-abcdef01234567890",
        "RelativePath": "directory1/directory2/file1.txt"
    },
    "Destination": {
        "LocationId": "loc-05ab2fdc272204a5f",
        "RelativePath": "directory1/directory2/file1.txt",
        "Metadata": {
            "Type": "Object",
            "ContentSize": 66060288,
            "LastModified": "2024-10-03T20:46:58Z",
            "S3": {
                "SystemMetadata": {
                    "ContentType": "binary/octet-stream",
                    "ETag": "\"1234abcd5678efgh9012ijkl3456mnop\"",
                    "ServerSideEncryption": "AES256"
                },
                "UserMetadata": {
                    "file-mtime": "1602647222/222919600"
                },
                "Tags": {}
            }
        }
    },
```

```
    "ErrorCode": "FileNotAtSource",
    "ErrorDetail": "Verification failed due to file being present at the destination
 but not at the source"
}
```

Basic mode log example

```
[NOTICE] Verification failed > /directory1/directory2/file1.txt
[NOTICE] /directory1/directory2/file1.txt   dstMeta: type=R mode=0755 uid=65534
 gid=65534 size=8972938 atime=1728657659/0 mtime=1728657659/0 extAttrsHash=0
[NOTICE]   dstHash: f9c2cca900301d38b0930367d8d587153154af467da0fdcf1bebc0848ec72c0d
```

Logging AWS DataSync API calls with AWS CloudTrail

AWS DataSync is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in DataSync. CloudTrail captures all API calls for DataSync as events. The calls that are captured include calls from the DataSync console and code calls to DataSync API operations.

If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for AWS DataSync. If you don't configure a trail, you can still view the most recent events in the CloudTrail console in **Event history**. Using the information collected by CloudTrail, you can determine the request that was made to AWS DataSync, the IP address from which the request was made, who made the request, when it was made, and additional details.

To learn more about CloudTrail, see the AWS CloudTrail User Guide.

Working with DataSync information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When activity occurs in AWS DataSync, that activity is recorded in a CloudTrail event along with other AWS service events in **Event history**. You can view, search, and download recent events in your AWS account. For more information, see Viewing events with CloudTrail event history.

For an ongoing record of events in your AWS account, including events for AWS DataSync, create a trail. A *trail* enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when you create a trail in the console, the trail applies to all AWS Regions. The trail logs events from all AWS Regions in the same AWS partition and delivers the log files to the Amazon S3 bucket that you

specify. Additionally, you can configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs. For more information, see the following:

- Overview for creating a trail
- CloudTrail supported services and integrations
- Configuring Amazon SNS notifications for CloudTrail
- Receiving CloudTrail log files from multiple Regions and Receiving CloudTrail log files from multiple accounts

All DataSync actions are logged by CloudTrail. (For more information, see the DataSync API reference.)

For example, calls to the `CreateAgent`, `CreateTask`, and `ListLocations` operations generate entries in the CloudTrail log files.

Every event or log entry contains information about who generated the request. The identity information helps you determine the following:

- Whether the request was made with root or AWS Identity and Access Management (IAM) credentials.
- Whether the request was made with temporary security credentials for a role or federated user.
- Whether the request was made by another AWS service.

For more information, see CloudTrail userIdentity element in the *AWS CloudTrail User Guide.*

Understanding DataSync log file entries

A trail is a configuration that enables delivery of events as log files to an Amazon S3 bucket that you specify. CloudTrail log files contain one or more log entries. An event represents a single request from any source and includes information about the requested action, the date and time of the action, the request parameters, and so on. CloudTrail log files aren't an ordered stack trace of the public API calls, so they don't appear in any specific order.

The following example shows a CloudTrail log entry that demonstrates the `CreateTask` operation.

```
{
    "eventVersion": "1.05",
```

```
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "1234567890abcdef0",
        "arn": "arn:aws:iam::123456789012:user/user1",
        "accountId": "123456789012",
        "accessKeyId": "access key",
        "userName": "user1",
        "sessionContext": {
            "attributes": {
                "mfaAuthenticated": "false",
                "creationDate": "2018-12-13T14:56:46Z"
            }
        },
        "invokedBy": "signin.amazonaws.com"
    },
    "eventTime": "2018-12-13T14:57:02Z",
    "eventSource": "datasync.amazonaws.com",
    "eventName": "CreateTask",
    "awsRegion": "ap-southeast-1",
    "sourceIPAddress": "192.0.2.1",
    "userAgent": "signin.amazonaws.com",
    "requestParameters": {
        "cloudWatchLogGroupArn": "arn:aws:logs:ap-southeast-1:123456789012:log-
group:MyLogGroup",
        "name": "MyTask-NTIzMzY1",
        "tags": [],
        "destinationLocationArn": "arn:aws:datasync:ap-
southeast-1:123456789012:location/loc-abcdef01234567890",
        "options": {
            "bytesPerSecond": -1,
            "verifyMode": "POINT_IN_TIME_CONSISTENT",
            "uid": "INT_VALUE",
            "posixPermissions": "PRESERVE",
            "mtime": "PRESERVE",
            "gid": "INT_VALUE",
            "preserveDevices": "NONE",
            "preserveDeletedFiles": "REMOVE",
            "atime": "BEST_EFFORT"
        },
        "sourceLocationArn": "arn:aws:datasync:ap-southeast-1:123456789012:location/
loc-021345abcdef6789"
    },
    "responseElements": {
```

```
        "taskArn": "arn:aws:datasync:ap-southeast-1:123456789012:task/
task-1234567890abcdef0"
    },
    "requestID": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "eventID": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
    "eventType": "AwsApiCall",
    "recipientAccountId": "123456789012"
}
```

Monitoring events by using Amazon EventBridge

Amazon EventBridge events describe changes in DataSync resources. You can set up rules to match these events and route them to one or more target functions or streams. Events are emitted on a best-effort basis.

DataSync transfer events

The following EventBridge events are available for DataSync transfers.

Agent state changes

Event	Description
Online	The agent is configured properly and ready to use. This is the normal running status for an agent.
Offline	The agent has been out of contact with the DataSync service for five minutes or longer. This can happen for a few reasons. For more information, see What do I do if my agent is offline?

Location state changes

Event	Description
Adding	DataSync is adding a location.
Available	The location is created and is available to use.

Agent state changes

Task state changes

Event	Description
Available	The task was created and is ready to start.
Running	The task is in progress and functioning properly.
Unavailable	The task isn't configured properly and can't be used. You might see this event when an agent associated with the task goes offline.
Queued	Another task is running and using the same agent. DataSync runs tasks in series (first in, first out).

Task execution state changes

Event	Description
Queueing	Another task execution is running and using the same DataSync agent. For more informati on, see Knowing when your task is queued.
Launching	DataSync is initializing the task execution. This status usually goes quickly but can take up to a few minutes.
Preparing	DataSync is determining what data to transfer. This step can take just minutes or a few hours depending on the number of files, objects, or directories in both locations and on how you configure your task. Preparation also might not be applicable to your task. For more information, see How DataSync prepares your data transfer.

Agent state changes	
Transferring	DataSync is performing the actual data transfer.
Verifying	DataSync is performing a data-integrity check at the end of the transfer.
Success	The task execution succeeded.
Cancelling	The task execution is in the process of being cancelled.
Error	The task execution failed.

Monitoring AWS DataSync with manual tools

You can track your AWS DataSync transfers from the console or the command line.

Monitoring your transfer by using the DataSync console

You can monitor your DataSync transfer by using the console, which provides real-time metrics such as data transferred, data and file throughput, and data compression.

To monitor your transfer by using the DataSync console

1. After you start your DataSync task, choose **See execution details**.
2. View metrics about your transfer.

Monitoring your transfer by using the AWS CLI

You can monitor your DataSync transfer by using the AWS Command Line Interface (AWS CLI).

Copy the following `describe-task-execution` command. To use this example command, replace the *`user input placeholders`* with your own information.

```
aws datasync describe-task-execution \
  --task-execution-arn 'arn:aws:datasync:region:account-id:task/task-id/execution/task-execution-id'
```

This command returns information about a task execution similar to that shown following.

```
{
    "BytesCompressed": 3500,
    "BytesTransferred": 5000,
    "BytesWritten": 5000,
    "EstimatedBytesToTransfer": 5000,
    "EstimatedFilesToDelete": 10,
    "EstimatedFilesToTransfer": 100,
    "FilesDeleted": 10,
    "FilesSkipped": 0,
    "FilesTransferred": 100,
    "FilesVerified": 100,
    "Result": {
        "ErrorCode": "??????",
        "ErrorDetail": "??????",
        "PrepareDuration": 100,
        "PrepareStatus": "SUCCESS",
        "TransferDuration": 60,
        "TransferStatus": "AVAILABLE",
        "VerifyDuration": 30,
        "VerifyStatus": "SUCCESS"
    },
    "StartTime": 1532660733.39,
    "Status": "SUCCESS",
    "OverrideOptions": {
        "Atime": "BEST_EFFORT",
        "BytesPerSecond": "1000",
        "Gid": "NONE",
        "Mtime": "PRESERVE",
        "PosixPermissions": "PRESERVE",
        "PreserveDevices": "NONE",
        "PreserveDeletedFiles": "PRESERVE",
        "Uid": "NONE",
        "VerifyMode": "POINT_IN_TIME_CONSISTENT"
    },
    "TaskExecutionArn": "arn:aws:datasync:us-east-1:111222333444:task/task-
aaaabbbbccccddddf/execution/exec-1234abcd1234abcd1",
    "TaskReportConfig": {
        "Destination": {
            "S3": {
                "BucketAccessRoleArn": "arn:aws:iam::111222333444:role/my-datasync-
role",
                "S3BucketArn": "arn:aws:s3:::amzn-s3-demo-bucket/*",
```

```
                "Subdirectory": "reports"
            }
        },
        "ObjectVersionIds": "INCLUDE",
        "OutputType": "STANDARD",
        "Overrides": {
            "Deleted": {
                "ReportLevel": "ERRORS_ONLY"
            },
            "Skipped": {
                "ReportLevel": "SUCCESSES_AND_ERRORS"
            },
            "Transferred": {
                "ReportLevel": "ERRORS_ONLY"
            },
            "Verified": {
                "ReportLevel": "ERRORS_ONLY"
            }
        },
        "ReportLevel": "ERRORS_ONLY"
    }
}
```

- If the task execution succeeds, the value of **Status** changes to **SUCCESS**. For information about what the response elements mean, see DescribeTaskExecution.
- If the task execution fails, the result sends error codes that can help you troubleshoot issues. For information about the error codes, see TaskExecutionResultDetail.

Monitoring your transfer by using the `watch` utility

To monitor the progress of your task in real time from the command line, you can use the standard Unix `watch` utility. Task execution duration values are measured in milliseconds.

The `watch` utility doesn't recognize the DataSync alias. The following example shows how to invoke the CLI directly. To use this example command, replace the *`user input placeholders`* with your own information.

```
# pass '-n 1' to update every second and '-d' to highlight differences
        $ watch -n 1 -d \ "aws datasync describe-task-execution --task-execution-arn
 'arn:aws:datasync:region:account-id:task/task-id/execution/task execution-id'"
```

Managing AWS DataSync resources

Learn how to manage your AWS DataSync resources, such as agents, locations, and tasks.

Managing your DataSync agent

Once you activate a DataSync agent, AWS manages the agent for you (including software updates). Learn more

Testing your DataSync agent's connectivity and system resources

While AWS manages your DataSync agent once it's deployed and activated, there might be cases where you need to change your agent's settings or troubleshoot an issue. Learn more

Replacing your DataSync agent

To replace a DataSync agent, you must create a new agent and update any locations that are using the old agent. Learn more

Cleaning up DataSync resources

If you used DataSync for a test or just no longer need its resources, delete those resources so that you aren't charged for them. Learn more

Reusing a DataSync agent's infrastructure

After you delete an agent resource from DataSync, you can still use the agent's virtual machine or Amazon EC2 instance to activate a new agent. Learn more

Managing your AWS DataSync agent

Once you activate an AWS DataSync agent, AWS manages the virtual machine (VM) appliance for you.

Agent software updates

AWS automatically updates your agent's software, including the underlying operating system and related DataSync software packages.

DataSync updates your agent only when it's idle. For example, your agent won't be updated until your transfer is complete.

The agent might go offline briefly following updates. This can happen, for instance, shortly after agent activation when AWS updates the agent.

Important

- DataSync automatically and regularly patches agents to maintain their security and stability. DataSync Basic mode agents use Amazon Linux 2 as their base operating system. DataSync Enhanced mode agents use Amazon Linux 2023 as their base operating system. You can view the current status of detected Common Vulnerabilities and Exposures (CVE) issues on the Amazon Linux Security Center. CVE patches are automatically applied within 30 days of their release date, as indicated on the Amazon Linux Security Center. Patching occurs as long as your agent is online and not actively running a task execution.
- DataSync doesn't support updating an Amazon EC2 agent manually with cloud-init directives. If you update an agent this way, you may encounter interoperability problems with DataSync where you can’t activate or use the agent.

Agent statuses

The following table describes the status of DataSync agents.

Agent status	Meaning
Online	The agent is configured properly and ready to use. This is the normal running status for an agent.
Offline	The agent has been out of contact with the DataSync service for

Agent status	Meaning
	five minutes or longer. This can happen for a few reasons. For more information, see What do I do if my agent is offline?

Troubleshooting your agent

While AWS manages the DataSync agent for you, there are situations when you might need to again work directly with it. For example, if your agent goes offline or loses its connection to your on-premises storage system, you can try to resolve these issues in the agent's local console.

For more information, see troubleshooting DataSync agents.

Performing maintenance on your agent

While AWS manages your AWS DataSync agent once it's deployed and activated, there might be cases where you need to change your agent's settings or troubleshoot an issue. Here are some examples of why you'd work with your agent through its local console:

- Manually assign an IP address to the agent.
- Check your agent's system resources.

> **Important**
>
> You don't need to use the agent's local console for standard DataSync functionality.

Accessing your agent's local console

How you access the local console depends on the type of agent you're using.

Accessing the local console (VMware ESXi, Linux KVM, Nutanix AHV, or Microsoft Hyper-V)

For security reasons, you can't remotely connect to the local console of the DataSync agent virtual machine (VM). You must access the local console from your hypervisor management interface.

- If this is your first time using the local console, log in with the temporary credentials. The initial user name is **`admin`** and the temporary password is **`password`**. You must change the password on first log in.

> **Note**
>
> Enhanced mode agents have the following password requirements:
>
> - Must contain a minimum of 15 characters
> - Must contain at least one uppercase character
> - Must contain at least one lowercase character
> - Must contain at least one numeric character
> - Must contain at least one special character
> - At least 50% of the characters must change on password update
> - The password cannot be a dictionary word

> **Note**
>
> After your initial password setup, you can change your password anytime. On the console main menu, enter the number next to **Command Prompt**, then run the `passwd` command to change the password.

Accessing the local console (Amazon EC2)

To connect to an Amazon EC2 agent's local console, you must use SSH.

Before you begin: Make sure that your EC2 instance's security group allows access with SSH (TCP port 22).

1. Open a terminal and copy the following `ssh` command:

```
ssh -i /path/key-pair-name.pem instance-user-name@instance-public-ip-address
```

   - For */path/key-pair-name*, specify the path and file name (`.pem`) of the private key required to connect to your instance.

- For *instance-user-name*, specify `admin`.
- For *instance-public-ip-address*, specify the public IP address of your instance.

2. Run the `ssh` command to connect to the instance.

Once connected, the main menu of the agent's local console displays.

Configuring your agent's DHCP, DNS, and IP settings

The default network configuration for the agent is Dynamic Host Configuration Protocol (DHCP). With DHCP, your agent is automatically assigned an IP address. In some cases, you might need to manually assign your agent's IP as a static IP address, as described following.

1. Log in to your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **1** to begin configuring your network.
3. On the **Network Configuration** menu, choose one of the following options.

To	Do this

Get information about your network adapter	Enter **1**.
	
	A list of adapter names appears, and you are prompted to enter an adapter name—for example, **`eth0`**. If the adapter you specify is in use, network information for that adapter is displayed, as in the following example:
	
	`IP Preference: IPv4`
	`MAC address: 52:54:12:a4:f7:7d`
	
	`IPv4 address: 192.168.100.482`
	`Netmask: 255.255.255.0`
	`Gateway: 192.168.100.4`
	`DHCP enabled: Yes`
	
	`IPv6 address: abcd:4444:e5ee:fd0`
	`0::4daf`

To	Do this

	<pre>Prefix length: 128
	Gateway: fe80::5021:ff:ff88:4acd
	DHCPV6 enabled: Yes
	
	DNS: abcd:4444:e5ee:fd00::1
	DNS: 192.168.100.4</pre>
	You use the same adapter name when you configure a static IP address (option **3**) as when you set your agent's default route adapter (option **5**).

Configure DHCP	Enter **2**. Choose an IP version to use, and then configure the network interface to use DHCP.
Configure a static IP address for your agent	Enter **3**. You are prompted to choose the IP protocol to use, IPv4, IPv6, or both. Then you're prompted to enter the Network adapter name to configure a static IP address. **Important** If your agent has already been activated, you must shut it down and restart it from the DataSync console for the settings to take effect.

To	Do this
Reset all your agent's network configuration to DHCP	Enter **4**. Choose the IP version to reset to DHCP. All network interfaces for the chosen IP version are set to use DHCP. **Important** If your agent has already been activated, you must shut down and restart your agent from the DataSync console for the settings to take effect.
Set your agent's default route adapter	Enter **5**. The available adapters for your agent are shown, and you are prompted to choose one of the adapters—for example, **`eth0`**.
Edit your agent's Domain Name System (DNS) configuration	Enter **6**. The available adapters of the primary and secondary DNS servers are displayed. You are prompted to provide the new IP address.

To	Do this
View your agent's DNS configuration	Enter **7**. The available adapters of the primary and secondary DNS servers are displayed. **Note** For some versions of the VMware hypervisor, you can edit the adapter configuration in this menu.
View routing tables	Enter **8**. Choose the IP version (IPv4, IPv6, or both) to view the default route table for your agent.
View your agent's IP version for data transfers	Enter **9**. The agent's IP version setting for data transfers displays, either `IPv4`, `IPv6`, `IPv4 (auto)`, or `IPv6 (auto)`.
Edit your agent's IP protocol for data transfers	Enter **10**. The available IP version settings for data transfers display. You can choose either `IPv4`, `IPv6`, `IPv4 (auto)`, or `IPv6 (auto)`. For more information about your agent's IP version setting for data transfers, see the section called “IPv6 support”.

Checking your agent's system resources

When you log in to your agent console, virtual CPU cores, root volume size, and RAM are automatically checked. If there are any errors or warnings, they're flagged on the console menu display with a banner that provides details about those errors or warnings.

If there are no errors or warnings when the console starts, the menu displays white text. The **View System Resource Check** option will display `(0 Errors)`.

If there are errors or warnings, the console menu displays the number of errors and warnings, in red and yellow respectively, in a banner across the top of the menu. For example, `(1 ERROR, 1 WARNING)`.

To check your agent's system resources

1. Log in to your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **4** to view the results of the system resource check.

   The console displays an **[OK]**, **[WARNING]**, or **[FAIL]** message for each resource as described in the table following.

   For Amazon EC2 instances, the system resource check verifies that the instance type is one of the instances recommended for use with DataSync. If the instance type matches that list, a single result is displayed in green text, as follows.

   ```
   [ OK ] Instance Type Check
   ```

   If the Amazon EC2 instance is not on the recommended list, the system resource check verifies the following resources.

   - CPU cores check: At least four cores are required.
   - Disk size check: A minimum of 80 GB of available disk space is required.
   - RAM check:
     - 32 GB of RAM assigned to the instance for task executions working with up to 20 million files, objects, or directories.
     - 64 GB of RAM assigned to the instance for task executions working with more than 20 million files, objects, or directories.
   - CPU flags check: The agent VM CPU must have either SSSE3 or SSE4 instruction set flags.

If the Amazon EC2 instance is not on the list of recommended instances for DataSync, but it has sufficient resources, the result of the system resource check displays four results, all in green text.

The same resources are verified for agents deployed in Hyper-V, Linux Kernel-based Virtual Machine (KVM), and VMware VMs.

VMware agents are also checked for supported version; unsupported versions cause a red banner error. Supported versions include VMware versions 6.5 and 6.7.

View and manage agent system time server configuration

You can view and manage your agent's system time server configuration.

1. Log in to your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter the option for **System Time Management** (such as **5** for VMware agent).
3. On the **System Time Management** menu, do one of the following:

To	Do this
View system time and service status	Enter **1**. View the current system time in UTC, time service status, active time servers, and sync hronization status.
Synchronize system time	Enter **2**. A prompt displays to synchronize the time server immediately. In some situations, an agent's time might drift. For example, there might be a prolon ged network outage and your hypervisor host and agent don't get time updates, so your

To	Do this
	agent's time is different from the actual time. When there's a time drift like this, a discrepancy occurs between the stated times when operations (such as snapshots occur) and the actual times that the operations occur.
Restart system time service	Enter **3**. A prompt displays to restart the time synchronization service.
Manage time server configuration	Enter **4**. View and manage your time server settings. Add or remove time servers and server pools, and set preferred servers for precise synchronization.

Running maintenance-related commands for your agent

In your DataSync agent's local console, you can perform some maintenance tasks and diagnose issues with your agent.

To run a configuration or diagnostic command in your agent's local console

1. Log in to your agent's local console.
2. On the **AWS DataSync Activation - Configuration** main menu, enter **5** (or **6** for a VMware VM) for the **Command Prompt**.
3. Use the following commands to perform the following tasks with your agent.

Command	Description
`dig`	Look up DNS information about the host.
`diskclean`	Perform disk cleanup.

Command	Description
exit	Return to the console configuration menu.
h	Display a list of available commands.
ifconfig	Display or configure network interfaces.
ip	Display or configure routing, devices, and tunnels.
iptables	Set up and maintain IPv4 packet filtering and NAT.
ip6tables	Set up and maintain IPv6 packet filtering and NAT.
ncport	Test connectivity to a specific network TCP port.
nping	Get information to troubleshoot network issues.
passwd	Change user password.
save-iptables	Save IPv4 table firewall rules permanently.
save-ip6tables	Save IPv6 table firewall rules permanently.
save-routing-table	Save a newly added routing table entry.
sslcheck	Verify whether an SSL certificate is valid.
tcptraceroute	Collect `traceroute` output on TCP traffic to a destination.

4. Follow the onscreen instructions.

Replacing your AWS DataSync agent

To replace an AWS DataSync agent, you must create a new agent and update any transfer locations that are using the old agent.

Creating a new agent

To create your new DataSync agent, follow the same process when you created your old agent:

1. Deploy an agent in your storage environment.
2. Choose a service endpoint that the agent uses to communicate with AWS.
3. Configure your network so that the agent can communicate with your storage and AWS.
4. Activate your agent.
5. Once activated, make note of the agent's Amazon Resource Name (ARN).

   You need this ARN when updating your DataSync location to use the new agent.

Updating your location with the new agent

Once you create a new agent, you can update an existing DataSync location to use this agent. In most cases, you also have to re-enter access credentials to update the location. This is because DataSync stores location credentials in a way that only your agent can use them.

Using the DataSync console

The following instructions describe how to update locations with a new agent by using the DataSync console.

NFS

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to update, then choose **Edit**.
4. For **Agents**, choose your new agent.

   You can choose more than one agent if you're replacing multiple agents for a location.
5. Choose **Save changes**.

SMB

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to update, then choose **Edit**.
4. For **Agents**, choose your new agent.

   You can choose more than one agent if you're replacing multiple agents for a location.
5. For **Password**, enter the password of the user that can mount your SMB file server and has permission to access the files and folders involved in your transfer.
6. Choose **Save changes**.

HDFS

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to update, then choose **Edit**.
4. For **Agents**, choose your new agent.

   You can choose more than one agent if you're replacing multiple agents for a location.
5. If you're using Kerberos authentication, upload your **Keytab file** and **Kerberos configuration file**.
6. Choose **Save changes**.

Object storage

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to update, then choose **Edit**.
4. For **Agents**, choose your new agent.

   You can choose more than one agent if you're replacing multiple agents for a location.
5. If your location requires credentials, enter the **Secret key** that allows DataSync to access your object storage bucket.
6. Choose **Save changes**.

Azure Blob Storage

Do the following to update your Microsoft Azure Blob Storage location:

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to update, then choose **Edit**.
4. For **Agents**, choose your new agent.

   You can choose more than one agent if you're replacing multiple agents for a location.
5. For **SAS token**, enter the shared access signature (SAS) token that allows DataSync to access your blob storage.
6. Choose **Save changes**.

Using the AWS CLI

The following instructions describe how to update locations with a new agent by using the AWS CLI. (You can also do this by using the DataSync API.)

NFS

1. Copy the following update-location-nfs command:

```
aws datasync update-location-nfs \
  --location-arn datasync-nfs-location-arn \
  --on-prem-config AgentArns=new-datasync-agent-arn
```

2. For the `--location-arn` parameter, specify the ARN of the NFS location that you're updating.
3. For the `--on-prem-config` parameter's `AgentArns` option, specify the ARN of your new agent.

   You can specify more than one ARN if you're replacing multiple agents for a location.
4. Run the `update-location-nfs` command to update the location.

SMB

1. Copy the following update-location-smb command:

```
aws datasync update-location-smb \
  --location-arn datasync-smb-location-arn \
  --agent-arns new-datasync-agent-arn \
  --password smb-file-server-password
```

2. For the `--location-arn` parameter, specify the ARN of the SMB location that you're updating.
3. For the `--agent-arns` parameter, specify the ARN of your new agent.

   You can specify more than one ARN if you're replacing multiple agents for a location.
4. For the `--password` parameter, specify the password of the user that can mount your SMB file server and has permission to access the files and folders involved in your transfer.
5. Run the `update-location-smb` command to update the location.

HDFS

1. Copy the following update-location-hdfs command:

```
aws datasync update-location-hdfs \
  --location-arn datasync-hdfs-location-arn \
  --agent-arns new-datasync-agent-arn \
  --kerberos-keytab keytab-file \
  --kerberos-krb5-conf krb5-conf-file
```

2. For the `--location-arn` parameter, specify the ARN of the HDFS location that you're updating.
3. For the `--agent-arns` parameter, specify the ARN of your new agent.

   You can specify more than one ARN if you're replacing multiple agents for a location.
4. If you're using Kerberos authentication, include the `--kerberos-keytab` and `--kerberos-krb5-conf` parameters:

   - For the `--kerberos-keytab` parameter, specify the Kerberos key table (keytab) that contains mappings between the defined Kerberos principal and encrypted keys.

     You can specify the keytab file by providing the file's address.
   - For the `--kerberos-krb5-conf` parameter, specify the file that contains the configuration for your Kerberos realm.

You can specify the `krb5.conf` file by providing the file's address.

If you're using simple authentication, you don't need to include these Kerberos-related parameters in your command.

5. Run the `update-location-hdfs` command to update the location.

Object storage

1. Copy the following update-location-object-storage command:

```
aws datasync update-location-object-storage \
  --location-arn datasync-object-storage-location-arn \
  --agent-arns new-datasync-agent-arn \
  --secret-key bucket-secret-key
```

2. For the `--location-arn` parameter, specify the ARN of the object storage location that you're updating.
3. For the `--agent-arns` parameter, specify the ARN of your new agent.

   You can specify more than one ARN if you're replacing multiple agents for a location.
4. Do the following depending on if your object storage location requires access credentials:

   - **If your location requires credentials** – For the `--secret-key` parameter, specify the secret key that allows DataSync to access your object storage bucket.
   - **If your location requires credentials** – Specify empty strings for the `--access-key` and `--secret-key` parameters. Here's an example command:

```
aws datasync update-location-object-storage \
  --location-arn arn:aws:datasync:us-east-2:111122223333:location/
loc-abcdef01234567890 \
  --agent-arns arn:aws:datasync:us-east-2:111122223333:agent/
agent-1234567890abcdef0 \
  --access-key "" \
  --secret-key ""
```

5. Run the `update-location-object-storage` command to update the location.

Azure Blob Storage

1. Copy the following update-location-azure-blob command:

```
aws datasync update-location-azure-blob \
  --location-arn datasync-azure-blob-storage-location-arn \
  --agent-arns new-datasync-agent-arn \
  --sas-configuration '{
      "Token": "sas-token-for-azure-blob-storage"
    }'
```

2. For the `--location-arn` parameter, specify the ARN of the Azure Blob Storage location that you're updating.
3. For the `--agent-arns` parameter, specify the ARN of your new agent.

   You can specify more than one ARN if you're replacing multiple agents for a location.
4. For the `--sas-configuration` parameter's `Token` option, specify the SAS token that allows DataSync to access your blob storage.
5. Run the `update-location-azure-blob` command to update the location.

Next steps

1. Delete your old agent. If you have any running DataSync tasks using this agent, wait until those tasks finish before deleting it.
2. If you need to replace agents for multiple locations, repeat the previous steps.
3. When you're done, you can resume running your tasks.

> **Note**
>
> **Replacing agents for scheduled tasks** – If you replace an agent for a scheduled task, you must start that task manually if the new agent is using a different type of service endpoint than your old agent. If you don't run the task manually before its next scheduled run, the task fails.
> For example, if your old agent used a public service endpoint, but the new agent uses a VPC endpoint, start that task manually by using the console or `StartTaskExecution` operation. After that, your task will resume running on its schedule.

Filtering AWS DataSync resources

You can filter your AWS DataSync locations and tasks by using the `ListLocations` and `ListTasks` API operations in the AWS CLI. For example, retrieve a list of your most recent tasks.

Parameters for filtering

You can use API filters to narrow down the list of resources returned by `ListTasks` and `ListLocations`. For example, to retrieve all of your Amazon S3 locations, you can use `ListLocations` with the filter name `LocationType` *`S3`* and `Operator` *`Equals`*.

To filter API results, you must specify a filter name, operator, and value.

- `Name` – The name of the filter that's being used. Each API call supports a list of filters that are available for it (for example, `LocationType` for `ListLocations`).
- `Values` – The values that you want to filter for. For example, you might want to display only Amazon S3 locations.
- `Operator` – The operator that's used to compare filter values (for example, `Equals` or `Contains`).

The following table lists the available operators.

Operator	Key types
`Equals`	String, Number
`NotEquals`	String, Number
`LessThan`	Number
`LessThanOrEqual`	Number
`GreaterThan`	Number
`GreaterThanOrEqual`	Number
`In`	String
`Contains`	String

Operator	Key types
NotContains	String
BeginsWith	String

Filtering by location

ListLocations supports the following filter names:

- LocationType – Filters on the location type:
  - SMB
  - NFS
  - HDFS
  - OBJECT_STORAGE
  - S3
  - OUTPOST_S3
  - FSX_WINDOWS
  - FSX_LUSTRE
  - FSX_OPENZFS_NFS
  - FSX_ONTAP_NFS
  - FSX_ONTAP_SMB
- LocationUri – Filters on the uniform resource identifier (URI) assigned to the location, as returned by the DescribeLocation* API call (for example, s3://*bucket-name*/*your-prefix* for Amazon S3 locations).
- CreationTime – Filters on the time that the location was created. The input format is yyyy-MM-dd:mm:ss in Coordinated Universal Time (UTC).

The following AWS CLI example lists all locations of type Amazon S3 that have a location URI starting with the string "s3://amzn-s3-demo-bucket" and that were created at or after 2019-12-15 17:15:20 UTC.

```
aws datasync list-locations \
```

```
    --filters [{Name=LocationType, Values=["S3"], Operator=Equals},
 {Name=LocationUri, Values=["s3://amzn-s3-demo-bucket"], Operator=BeginsWith},
 {Name=CreationTime,Values=["2019-12-15 17:15:20"],Operator=GreaterThanOrEqual}]
```

This command returns output similar to the following.

```
{
    "Locations": [
        {
            "LocationArn": "arn:aws:datasync:us-east-1:111122223333:location/
loc-333333333abcdef0",
            "LocationUri": "s3://amzn-s3-demo-bucket1/"
        },
        {
            "LocationArn": "arn:aws:datasync:us-east-1:123456789012:location/
loc-987654321abcdef0",
            "LocationUri": "s3://amzn-s3-demo-bucket2/"
        }
    ]
}
```

Filtering by task

`ListTasks` supports the following filter names.

- `LocationId` – Filters on both source and destination locations on Amazon Resource Name (ARN) values.
- `CreationTime` – Filters on the time that the task was created. The input format is `yyyy-MM-dd:mm:ss` in UTC.

The following AWS CLI example shows the syntax when filtering on `LocationId`.

```
aws datasync list-tasks \
    --filters Name=LocationId,Values=arn:aws:datasync:us-east-1:your-account-
id:location/your-location-id,Operator=Contains
```

The output of this command looks similar to the following.

```
{
    "Tasks": [
```

```
        {
            "TaskArn": "arn:aws:datasync:us-east-1:your-account-id:task/your-task-id",
            "Status": "AVAILABLE",
            "Name": "amzn-s3-demo-bucket"
        }
    ]
}
```

Cleaning up your AWS DataSync resources

If you used AWS DataSync for a test or don't need the AWS resources that you created, delete them so that you aren't charged for resources you don't plan to use.

> **Note**
>
> If you have DataSync resources in an opt-in Region that you disable, those resources aren't automatically deleted. The resources are still there if you enable that Region again.

Deleting a DataSync agent

When you delete an agent from AWS DataSync, the agent resource is no longer associated with your AWS account and can't be undone.

Keep in mind that deleting an agent from DataSync doesn't remove its virtual machine (VM) or Amazon EC2 instance from your storage environment. You can delete the VM or instance or reuse it to activate a new agent.

Prerequisites

Don't delete an agent until you update or remove the DataSync resources that depend on it. If you're replacing an agent, update your transfer locations with the new agent. If you aren't replacing an agent, delete transfer tasks and locations using that agent first.

Deleting the agent

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, choose **Agents**.

3. Choose the agent that you want to delete.
4. Choose **Delete**, enter **`delete`** in the text box that appears, and then choose **Delete**.
5. If you aren't planning to reuse the agent's infrastructure for other DataSync activities, delete the agent's VM or Amazon EC2 instance to remove it from your storage environment.

Reusing a DataSync agent's infrastructure

You can delete an agent resource from DataSync and still use the agent's underlying VM or Amazon EC2 instance to activate a new agent.

To reuse an agent's infrastructure

1. Test the agent's connection to AWS. If the network tests pass, go to the next step.

   The network tests must pass before you can move to the next step.
2. Delete the agent resource from DataSync but don't delete the agent's VM or Amazon EC2 instance.
3. Repeat step 1 to test the agent's connection to AWS again. If the network tests pass, go to the next step.
4. About three minutes after deleting the agent resource from DataSync, check if port 80 is open on the agent VM or Amazon EC2 instance. If it is, go to the next step.
5. Activate a new agent with the existing VM or Amazon EC2 instance.

   You can activate the new agent in a different AWS Region, AWS account, and with another type of service endpoint. If you use a different type of service endpoint, you have to adjust your network configuration.

Deleting a DataSync location

As a best practice, remove the AWS DataSync locations that you no longer need.

To remove a location by using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Locations**.
3. Choose the location that you want to remove.

4. Choose **Delete**. Confirm the deletion by entering **`delete`**, and then choose **Delete**.

Deleting a DataSync task

If you no longer need an AWS DataSync task, you can delete it and its related AWS resources.

Prerequisites

When you run a task, DataSync automatically creates and manages network interfaces for data transfer traffic. When you delete a task, you also delete its related network interfaces as long as you have the following permissions:

- `ec2:DeleteNetworkInterface`
- `ec2:DescribeNetworkInterfaces`
- `ec2:ModifyNetworkInterfaceAttribute`

These permissions are available in the AWS managed policy `AWSDataSyncFullAccess`. For more information, see AWS managed policies for AWS DataSync.

Deleting the task

Once you delete a task, you can't restore it.

Using the DataSync console

1. Open the AWS DataSync console at https://console.aws.amazon.com/datasync/.
2. In the left navigation pane, expand **Data transfer**, then choose **Tasks**.
3. Select the task that you want to delete.
4. Choose **Actions**, then choose **Delete**.
5. In the dialog box, choose **Delete**.

Using the AWS CLI

1. Copy the following `delete-task` command:

```
aws datasync delete-task \
      --task-arn "task-to-delete"
```

2. For the `--task-arn` parameter, specify the Amazon Resource Name (ARN) of the task you're deleting (for example, `arn:aws:datasync:us-east-2:123456789012:task/task-012345678abcd0123`).
3. Run the `delete-task` command.

Security in AWS DataSync

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that is built to meet the requirements of the most security-sensitive organizations.

Security is a shared responsibility between AWS and you. The shared responsibility model describes this as security *of* the cloud and security *in* the cloud:

- **Security of the cloud** – AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the AWS compliance programs. To learn about the compliance programs that apply to AWS DataSync, see AWS services in scope by compliance program.
- **Security in the cloud** – Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company's requirements, and applicable laws and regulations.

This documentation helps you understand how to apply the shared responsibility model when using DataSync. The following topics show you how to configure DataSync to meet your security and compliance objectives. You also learn how to use other AWS services that help you to monitor and secure your DataSync resources.

Topics

Data protection in AWS DataSync

AWS DataSync securely transfers data between self-managed storage systems and AWS storage services and also between AWS storage services. How your storage data is encrypted in transit depends in part on the locations involved in the transfer.

After the transfer completes, data is encrypted at rest by the system or service that's storing the data (not DataSync).

Topics

AWS DataSync encryption in transit

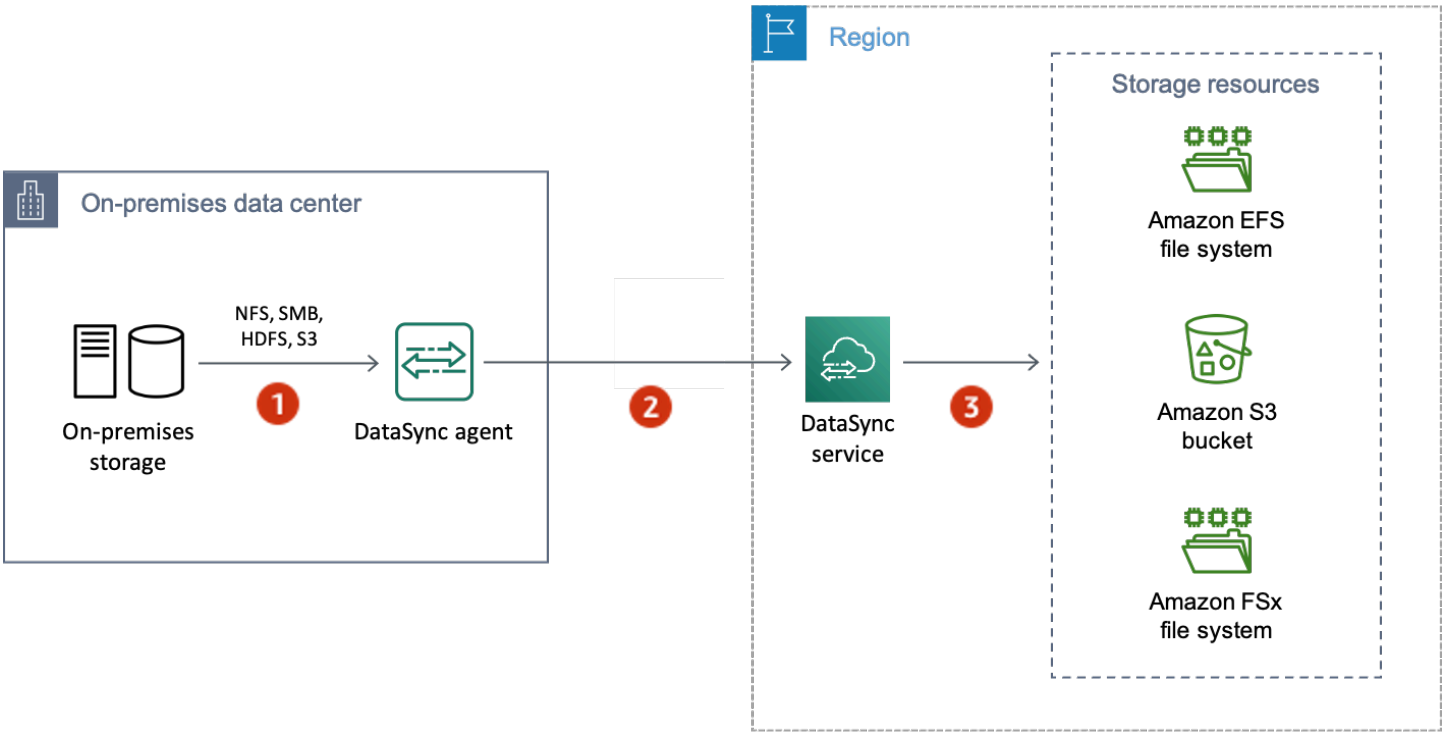
Your storage data (including metadata) is encrypted in transit, but how it's encrypted throughout the transfer depends on your source and destination locations.

When connecting with a location, DataSync uses the most secure options provided by that location's data access protocol. For example, when connecting with a file system using Server Message Block (SMB), DataSync uses the security features provided by SMB.

Network connections in a transfer

DataSync requires three network connections to copy data: a connection to read data from a source location, another to transfer data between locations, and one more to write data to a destination location.

The following diagram is an example of the network connections that DataSync uses to transfer data from an on-premises storage system to an AWS storage service. To understand where the connections happen and how data is protected as it transfers through each connection, use the accompanying table.



Reference	Network connection	Description
1	Reading data from the source location	DataSync connects by using the storage system's protocol for accessing data (for example, SMB or the Amazon S3 API). For this connection, data is protected by using the security features of the storage system unless DataSync doesn't support those features. For example, DataSync currently doesn't support Kerberos authentication with NFS file servers or when using TDE encryption with HDFS.
2	Transferring data between locations	For this connection, DataSync encrypts all network traffic with mutual Transport Layer Security (mTLS) 1.3.

Reference	Network connection	Description
3	Writing data to the destination location	As with the source location, DataSync connects by using the storage system's protocol for accessing data. Data is again protected by using the security features of the storage system unless DataSync doesn't support those features.

Learn how your data is encrypted in transit when DataSync connects to the following AWS storage services:

- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP
- Amazon S3

TLS ciphers

When transferring data between locations, DataSync uses different TLS ciphers. The TLS cipher depends on the type of service endpoint that your agent uses to communicate with DataSync. (For more information, see Choosing a service endpoint for your AWS DataSync agent.)

Contents

Public or VPC endpoints

For public and virtual private cloud (VPC) service endpoints, DataSync uses one of the following TLS ciphers:

- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (ecdh_x25519)
- TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256 (ecdh_x25519)
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (ecdh_x25519)

FIPS endpoints

For Federal Information Processing Standard (FIPS) service endpoints, DataSync uses the following TLS cipher:

- TLS_AES_128_GCM_SHA256 (secp256r1)

AWS DataSync encryption at rest

Because AWS DataSync is a transfer service, it generally doesn't manage your storage data at rest. The storage services and systems that DataSync supports are responsible for protecting data in that state. However, there is some service-related data that DataSync manages at rest.

What's encrypted?

The only data that DataSync handles at rest relates to the details it needs to complete your transfer. DataSync stores the following data with full at-rest encryption in Amazon DynamoDB:

- Task configurations (for example, details about the locations in your transfer).
- User credentials that allow your DataSync agent to authenticate with a location. These credentials are encrypted by using your agent's public keys. The agent can decrypt these keys as needed with its private keys.

For more information, see DynamoDB encryption at rest in the *Amazon DynamoDB Developer Guide*.

Key management

You can't manage the encryption keys that DataSync uses to store information in DynamoDB related to running your task. This information includes your task configurations and the credentials that agents use to authenticate with a storage location.

What's not encrypted?

Though DataSync doesn't control how your storage data is encrypted at rest, we still recommend configuring your locations with the highest level of security that they support. For example, you can encrypt objects with Amazon S3 managed encryption keys (SSE-S3) or AWS Key Management Service (AWS KMS) keys (SSE-KMS).

Learn more about how AWS storage services encrypt data at rest:

- Amazon S3
- Amazon EFS
- Amazon FSx for Windows File Server
- Amazon FSx for Lustre
- Amazon FSx for OpenZFS
- Amazon FSx for NetApp ONTAP

Internetwork traffic privacy

We recommend configuring your source and destination locations with the highest level of security that each one supports. When connecting to a location, AWS DataSync works with the most secure version of the data access protocol that the storage system uses. Additionally, consider limiting subnet traffic to known protocols and services.

DataSync secures the connection between locations—including between AWS accounts, AWS Regions, and Availability Zones—by using Transport Layer Security (TLS) 1.3.

Identity and access management in AWS DataSync

AWS uses security credentials to identify you and to grant you access to your AWS resources. You can use features of AWS Identity and Access Management (IAM) to allow other users, services, and applications to use your AWS resources fully or in a limited way, without sharing your security credentials.

By default, IAM identities (users, groups, and roles) don't have permission to create, view, or modify AWS resources. To allow users, groups, and roles to access AWS DataSync resources and interact with the DataSync console and API, we recommend that you use an IAM policy that grants them permission to use the specific resources and API actions that they will need. You then attach the

policy to the IAM identity that requires access. For an overview of the basic elements for a policy, see Access management for AWS DataSync.

Topics

Access management for AWS DataSync

Every AWS resource is owned by an AWS account. Permissions to create or access a resource are governed by permissions policies. An account administrator can attach permissions policies to AWS Identity and Access Management (IAM) identities. Some services (such as AWS Lambda) also support attaching permissions policies to resources.

> **Note**
>
> An *account administrator* is a user with administrator privileges in an AWS account. For more information, see IAM best practices in the *IAM User Guide*.

Topics

DataSync resources and operations

In DataSync, the primary resources are agent, location, task, and task execution.

These resources have unique Amazon Resource Names (ARNs) associated with them, as shown in the following table.

Resource type	ARN format
Agent ARN	`arn:aws:datasync:` *region*`:`*account-id* `:agent/`*agent-id*
Location ARN	`arn:aws:datasync:` *region*`:`*account-id* `:location/` *location-id*
Task ARN	`arn:aws:datasync:` *region*`:`*account-id* `:task/`*task-id*
Task execution ARN	`arn:aws:datasync:` *region*`:`*account-id* `:task/`*task-id*`/executio n/` *exec-id*

To grant permissions for specific API operations, such as creating a task, DataSync defines a set of actions that you can specify in a permissions policy. An API operation can require permissions for more than one action.

Understanding resource ownership

A *resource owner* is the AWS account that created the resource. That is, the resource owner is the AWS account of the *principal entity* (for example, an IAM role) which authenticates the request that creates the resource. The following examples illustrate how this behavior works:

- If you use the root account credentials of your AWS account to create a task, your AWS account is the owner of the resource (in DataSync, the resource is the task).
- If you create an IAM roles in your AWS account and grant permissions to the `CreateTask` action to that user, the user can create a task. However, your AWS account, to which the user belongs, owns the task resource.
- If you create an IAM role in your AWS account with permissions to create a task, anyone who can assume the role can create a task. Your AWS account, to which the role belongs, owns the task resource.

Managing access to resources

A permissions policy describes who has access to what. The following section explains the available options for creating permissions policies.

> **Note**
>
> This section discusses using IAM in the context of DataSync. It doesn't provide detailed information about the IAM service. For complete IAM documentation, see What is IAM? in the *IAM User Guide.* For information about IAM policy syntax and descriptions, see AWS Identity and Access Management policy reference in the *IAM User Guide.*

Policies attached to an IAM identity are referred to as *identity-based* policies (IAM policies) and policies attached to a resource are referred to as *resource-based* policies. DataSync supports only identity-based policies (IAM policies).

Topics

- Identity-based policies
- Resource-based policies

Identity-based policies

You can manage DataSync resource access with IAM policies. These policies can help an AWS account administrator do the following with DataSync:

- **Grant permissions to create and manage DataSync resources** – Create an IAM policy that allows an IAM role in your AWS account to create and manage DataSync resources, such as agents, locations, and tasks.
- **Grant permissions to a role in another AWS account or an AWS service** – Create an IAM policy that grants permissions to an IAM role in a different AWS account or an AWS service. For example:
  1. The Account A administrator creates an IAM role and attaches a permissions policy to the role that grants permissions on resources in Account A.
  2. The Account A administrator attaches a trust policy to the role that identifies Account B as the principal who can assume the role.

To grant an AWS service permissions to assume the role, the Account A administrator can specify an AWS service as the principal in the trust policy.

3. The Account B administrator can then delegate permissions to assume the role to any users in Account B. This allows anyone using the role in Account B to create or access resources in Account A.

For more information about using IAM to delegate permissions, see Access management in the *IAM User Guide*.

The following example policy grants permissions to all `List*` actions on all resources. This action is a read-only action and doesn't allow resource modification.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowAllListActionsOnAllResources",
            "Effect": "Allow",
            "Action": [
                "datasync:List*"
            ],
            "Resource": "*"
        }
    ]
}
```

For more information about using identity-based policies with DataSync, see AWS managed policies and customer managed policies. For more information about IAM identities, see the *IAM User Guide* .

Resource-based policies

Other services, such as Amazon S3, support resource-based permissions policies. For example, you can attach a policy to an Amazon S3 bucket to manage access permissions to that bucket. However, DataSync doesn't support resource-based policies.

Specifying policy elements: Actions, effects, resources, and principals

For each DataSync resource, the service defines a set of API operations (see Actions). To grant permissions for these API operations, DataSync defines a set of actions that you can specify in a

policy. For example, for the DataSync resource, the following actions are defined: `CreateTask`, `DeleteTask`, and `DescribeTask`. Performing an API operation can require permissions for more than one action.

The following are the most basic policy elements:

- **Resource** – In a policy, you use an Amazon Resource Name (ARN) to identify the resource to which the policy applies. For DataSync resources, you can use the wildcard character (`*`) in IAM policies. For more information, see DataSync resources and operations.
- **Action** – You use action keywords to identify resource operations that you want to allow or deny. For example, depending on the specified `Effect` element, the `datasync:CreateTask` permission allows or denies the user permissions to perform the DataSync `CreateTask` operation.
- **Effect** – You specify the effect when the user requests the specific action—this effect can be either `Allow` or `Deny`. If you don't explicitly grant access to (`Allow`) a resource, access is implicitly denied. You can also explicitly deny access to a resource, which you might do to make sure that a user cannot access it, even if a different policy grants that user access. For more information, see Authorization in the *IAM User Guide*.
- **Principal** – In identity-based policies (IAM policies), the user that the policy is attached to is the implicit principal. For resource-based policies, you specify the user, account, service, or other entity that you want to receive permissions (applies to resource-based policies only). DataSync doesn't support resource-based policies.

To learn more about IAM policy syntax and descriptions, see AWS Identity and Access Management policy reference in the *IAM User Guide*.

Specifying conditions in a policy

When you grant permissions, you can use the IAM policy language to specify the conditions when a policy should take effect when granting permissions. For example, you might want a policy to be applied only after a specific date. For more information about specifying conditions in policy language, see Condition in the *IAM User Guide*.

To express conditions, you use predefined condition keys. There are no condition keys specific to DataSync. However, there are AWS wide condition keys that you can use as appropriate. For a complete list of AWS wide keys, see Available keys in the *IAM User Guide*.

Creating an VPC endpoint policy

VPC endpoint policies help control access to DataSync API operations through DataSync VPC service endpoints and FIPS-enabled VPC service endpoints. VPC endpoint policies allow you to restrict specific DataSync API actions accessed through your VPC service endpoints, such as `CreateTask` or `StartTaskExecution`.

An endpoint policy specifies the following information:

- The principals that can perform actions.
- The actions that can be performed.
- The resources on which actions can be performed.

For more information, see Control access to VPC endpoints using endpoint policies.

Example policy

The following is an example of a endpoint policy.

```
{
    "Version": "2012-10-17",
    "Statement": [
      {
        "Effect": "Allow",
        "Principal": "*",
        "Action": [
          "datasync:CreateTask",
          "datasync:StartTaskExecution",
          "datasync:DescribeTask"
        ],
        "Resource": "arn:aws:datasync:us-east-1:123456789012:task/*"
      }
   ]
}
```

AWS managed policies for AWS DataSync

To add permissions to users, groups, and roles, it's easier to use AWS managed policies than to write policies yourself. It takes time and expertise to create IAM customer managed policies that

provide your team with only the permissions they need. To get started quickly, you can use our AWS managed policies. These policies cover common use cases and are available in your AWS account. For more information about AWS managed policies, see AWS managed policies in the *IAM User Guide*.

AWS services maintain and update AWS managed policies. You can't change the permissions in AWS managed policies. Services occasionally add additional permissions to an AWS managed policy to support new features. This type of update affects all identities (users, groups, and roles) where the policy is attached. Services are most likely to update an AWS managed policy when a new feature is launched or when new operations become available. Services do not remove permissions from an AWS managed policy, so policy updates won't break your existing permissions.

Additionally, AWS supports managed policies for job functions that span multiple services. For example, the `ReadOnlyAccess` AWS managed policy provides read-only access to all AWS services and resources. When a service launches a new feature, AWS adds read-only permissions for new operations and resources. For a list and descriptions of job function policies, see AWS managed policies for job functions in the *IAM User Guide*.

AWS managed policy: AWSDataSyncReadOnlyAccess

You can attach the `AWSDataSyncReadOnlyAccess` policy to your IAM identities. This policy grants read-only permissions for DataSync.

To view the permissions for this policy, see AWSDataSyncReadOnlyAccess in the *AWS Managed Policy Reference* .

AWS managed policy: AWSDataSyncFullAccess

You can attach the `AWSDataSyncFullAccess` policy to your IAM identities. This policy grants administrative permissions for DataSync and is required for AWS Management Console access to the service. `AWSDataSyncFullAccess` provides full access to DataSync API operations and the operations that interact with related resources (such as Amazon S3 buckets, Amazon EFS file systems, AWS KMS keys, and Secrets Manager secrets). The policy also grants permissions for Amazon CloudWatch, including creating log groups and creating or updating a resource policy.

To view the permissions for this policy, see AWSDataSyncFullAccess in the *AWS Managed Policy Reference* .

AWS managed policy: AWSDataSyncServiceRolePolicy

You can't attach the `AWSDataSyncServiceRolePolicy` policy to your IAM identities. This policy is attached to a service-linked role that allows DataSync to perform actions on your behalf. For more information, see Using service-linked roles for DataSync.

This policy grants administrative permissions that allow the service-linked role to create Amazon CloudWatch logs for DataSync tasks using Enhanced mode.

Policy updates

Change	Description	Date
AWSDataSyncFullAccess – Change	DataSync modified permission statements for `AWSDataSyncFullAccess` : The updated statements remove tagging conditions from the permissions DataSync uses to create Secrets Manager secrets.	May 13, 2025
AWSDataSyncFullAccess – Change	DataSync added new permissions to `AWSDataSyncFullAccess` : • `secretsmanager:CreateSecret` • `secretsmanager:PutSecretValue` • `secretsmanager:DeleteSecret` • `secretsmanager:UpdateSecret` These permissions let DataSync create, edit, and	May 7, 2025

Change	Description	Date
	delete AWS Secrets Manager secrets.	
AWSDataSyncFullAccess – Change	DataSync added new permissions to `AWSDataSyncFullAccess` : • `secretsmanager:ListSecrets` • `kms:ListAliases` • `kms:DescribeKey` These permissions let DataSync retrieve metadata about your AWS Secrets Manager secrets and AWS KMS keys, including any aliases associated with your keys.	April 23, 2025

Change	Description	Date
AWSDataSyncService RolePolicy – Change	DataSync added new permissions to the `AWSDataSyncService RolePolicy` policy that's used by the DataSync service-linked role `AWSServic eRoleForDataSync` : • `secretsmanager:Des cribeSecret` • `secretsmanager:Get SecretValue` These permissions let DataSync read metadata and values for secrets managed by AWS Secrets Manager.	April 15, 2025
AWSDataSyncService RolePolicy – New policy	DataSync added a policy that's used by the DataSync service-linked role `AWSServiceRoleForD ataSync` . This new managed policy automatically creates Amazon CloudWatch logs for your DataSync tasks that use Enhanced mode.	October 30, 2024

Change	Description	Date
AWSDataSyncFullAccess – Change	DataSync added new a permission to `AWSDataSyncFullAccess` : • `iam:CreateServiceLinkedRole` This permission lets DataSync create service-linked roles for you.	October 30, 2024
AWSDataSyncFullAccess – Change	DataSync added new a permission to `AWSDataSyncFullAccess` : • `ec2:DescribeRegions` This permission lets you choose opt-in Regions when creating a DataSync task for transfers between AWS Regions.	July 22, 2024
AWSDataSyncFullAccess – Change	DataSync added new a permission to `AWSDataSyncFullAccess` : • `s3:ListBucketVersions` This permission lets you choose a specific version of your DataSync manifest.	February 16, 2024

Change	Description	Date
AWSDataSyncFullAccess – Change	DataSync added new permissions to `AWSDataSyncFullAccess` : • `ec2:DescribeVpcEndpoints` • `elasticfilesystem:DescribeAccessPoints` • `fsx:DescribeStorageVirtualMachines` • `outposts:ListOutposts` • `s3:GetBucketLocation` • `s3-outposts:ListAccessPoints` • `s3-outposts:ListRegionalBuckets` These permissions help you create DataSync agents and locations for Amazon EFS, Amazon FSx for NetApp ONTAP, Amazon S3, and S3 on Outposts.	May 2, 2023
DataSync started tracking changes	DataSync started tracking changes for its AWS managed policies.	March 1, 2021

IAM customer managed policies for AWS DataSync

In addition to AWS managed policies, you also can create your own identity-based policies for AWS DataSync and attach them to the AWS Identity and Access Management (IAM) identities that require those permissions. These are known as *customer managed policies*, which are standalone policies that you administer in your own AWS account.

> **Important**
>
> Before you begin, we recommend that you learn about the basic concepts and options for managing access to your DataSync resources. For more information, see Access management for AWS DataSync.

When creating a customer managed policy, you include statements about DataSync operations that can be used on certain AWS resources. The following example policy has two statements (note the `Action` and `Resource` elements in each statement):

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowsSpecifiedActionsOnAllTasks",
            "Effect": "Allow",
            "Action": "datasync:DescribeTask",
            "Resource": "arn:aws:datasync:us-east-1:111122223333:task/*"
        },
        {
            "Sid": "ListAllTasks",
            "Effect": "Allow",
            "Action": "datasync:ListTasks",
            "Resource": "*"
        }
    ]
}
```

The policy's statements do the following:

- The first statement grants permissions to perform the `datasync:DescribeTask` action on certain transfer task resources by specifying an Amazon Resource Name (ARN) with a wildcard character (*).
- The second statement grants permissions to perform the `datasync:ListTasks` action on all tasks by specifying just a wildcard character (*) .

Examples of customer managed policies

The following example customer managed policies grant permissions for various DataSync operations. The policies work if you're using the AWS Command Line Interface (AWS CLI) or an AWS SDK. To use these policies in the console, you must also use the managed policy `AWSDataSyncFullAccess`.

Topics

Example 1: Create a trust relationship that allows DataSync to access your Amazon S3 bucket

The following is an example of a trust policy that allows DataSync to assume an IAM role. This role allows DataSync to access an Amazon S3 bucket. To prevent the cross-service confused deputy problem, we recommend using the `aws:SourceArn` and `aws:SourceAccount` global condition context keys in the policy.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "datasync.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
            "Condition": {
                "StringEquals": {
                "aws:SourceAccount": "111111111111"
                },
```

```
                "ArnLike": {
                "aws:SourceArn": "arn:aws:datasync:us-east-1:111111111111:*"
                }
            }
        }
    ]
}
```

Example 2: Allow DataSync to read and write to your Amazon S3 bucket

The following example policy grants DataSync the minimum permissions to read and write data to an S3 bucket that's used as a destination location.

> **Note**
>
> The value for `aws:ResourceAccount` should be the account ID that owns the Amazon S3 bucket specified in the policy.

```
{
 "Version": "2012-10-17",
 "Statement": [
     {
         "Action": [
             "s3:GetBucketLocation",
             "s3:ListBucket",
             "s3:ListBucketMultipartUploads"
         ],
         "Effect": "Allow",
         "Resource": "arn:aws:s3:::amzn-s3-demo-bucket",
         "Condition": {
             "StringEquals": {
                 "aws:ResourceAccount": "123456789012"
             }
         }
     },
     {
         "Action": [
             "s3:AbortMultipartUpload",
             "s3:DeleteObject",
             "s3:GetObject",
             "s3:GetObjectTagging",
```

```
            "s3:GetObjectVersion",
            "s3:GetObjectVersionTagging",
            "s3:ListMultipartUploadParts",
            "s3:PutObject",
            "s3:PutObjectTagging"
          ],
        "Effect": "Allow",
        "Resource": "arn:aws:s3:::amzn-s3-demo-bucket/*",
        "Condition": {
            "StringEquals": {
                "aws:ResourceAccount": "123456789012"
            }
        }
    }
 ]
}
```

Example 3: Allow DataSync to upload logs to CloudWatch log groups

DataSync requires permissions to be able to upload logs to your Amazon CloudWatch log groups. You can use CloudWatch log groups to monitor and debug your tasks.

For an example of an IAM policy that grants such permissions, see Allowing DataSync to upload logs to a CloudWatch log group.

Using service-linked roles for DataSync

AWS DataSync uses AWS Identity and Access Management (IAM) service-linked roles. A service-linked role is a unique type of IAM role that is linked directly to DataSync. Service-linked roles are predefined by DataSync and include all the permissions that the service requires to call other AWS services on your behalf.

Topics

- Using roles for DataSync

Using roles for DataSync

AWS DataSync uses AWS Identity and Access Management (IAM) service-linked roles. A service-linked role is a unique type of IAM role that is linked directly to DataSync. Service-linked roles are predefined by DataSync and include all the permissions that the service requires to call other AWS services on your behalf.

A service-linked role makes setting up DataSync easier because you don't have to manually add the necessary permissions. DataSync defines the permissions of its service-linked roles, and unless defined otherwise, only DataSync can assume its roles. The defined permissions include the trust policy and the permissions policy, and that permissions policy cannot be attached to any other IAM entity.

You can delete a service-linked role only after first deleting their related resources. This protects your DataSync resources because you can't inadvertently remove permission to access the resources.

For information about other services that support service-linked roles, see AWS services that work with IAM and look for the services that have **Yes** in the **Service-linked roles** column. Choose a **Yes** with a link to view the service-linked role documentation for that service.

Service-linked role permissions for DataSync

DataSync uses the service-linked role named **AWSServiceRoleForDataSync** – Allows DataSync to perform essential operations for transfer task execution, including reading secrets from AWS Secrets Manager, and creating CloudWatch log groups and events.

The AWSServiceRoleForDataSync service-linked role trusts the following services to assume the role:

- `datasync.amazonaws.com`

The service-linked role uses the AWS managed policy named AWSDataSyncServiceRolePolicy, which allows DataSync to complete the following actions on the specified resources:

```
{
    "Version": "2012-10-17",
    "Statement": [{
            "Sid": "DataSyncCloudWatchLogCreateAccess",
            "Effect": "Allow",
            "Action": [
                "logs:CreateLogGroup",
                "logs:CreateLogStream"
            ],
            "Resource": [
                "arn:*:logs:*:*:log-group:/aws/datasync*"
            ]
```

```
        },
        {
            "Sid": "DataSyncCloudWatchLogStreamUpdateAccess",
            "Effect": "Allow",
            "Action": [
                "logs:PutLogEvents"
            ],
            "Resource": [
                "arn:*:logs:*:*:log-group:/aws/datasync*:log-stream:*"
            ]
        },
        {
            "Sid": "DataSyncSecretsManagerReadAccess",
            "Effect": "Allow",
            "Action": [
                "secretsmanager:DescribeSecret",
                "secretsmanager:GetSecretValue"
            ],
            "Resource": [
                "arn:*:secretsmanager:*:*:secret:aws-datasync!*"
            ],
            "Condition": {
                "StringEquals": {
                    "secretsmanager:ResourceTag/aws:secretsmanager:owningService":
 "aws-datasync",
                    "aws:ResourceAccount": "${aws:PrincipalAccount}"
                }
            }
        }
    ]
}
```

You must configure permissions to allow your users, groups, or roles to create, edit, or delete a service-linked role. For more information, see Service-linked role permissions in the *IAM User Guide*.

Creating a service-linked role for DataSync

You don't need to manually create a service-linked role. When you create a DataSync task in the AWS Management Console, the AWS CLI, or the AWS API, DataSync creates the service-linked role for you.

In the AWS CLI or the AWS API, you can create a service-linked role with the `datasync.amazonaws.com` service name. For more information, see Creating a service-linked

role in the *IAM User Guide*. If you delete this service-linked role, you can use this same process to create the role again.

If you delete this service-linked role, and then need to create it again, you can use the same process to recreate the role in your account. When you create a DataSync task, DataSync creates the service-linked role for you again.

If you delete this service-linked role, you can use the same IAM process to create the role again.

Editing a service-linked role for DataSync

DataSync does not allow you to edit the AWSServiceRoleForDataSync service-linked role. After you create a service-linked role, you cannot change the name of the role because various entities might reference the role. However, you can edit the description of the role using IAM. For more information, see Editing a service-linked role in the *IAM User Guide*.

Deleting a service-linked role for DataSync

If you no longer need to use a feature or service that requires a service-linked role, we recommend that you delete that role. That way you don't have an unused entity that is not actively monitored or maintained. However, you must clean up your service-linked role before you can manually delete it.

Cleaning up a service-linked role

Before you can use IAM to delete a service-linked role, you must first delete any resources used by the role.

> **Note**
>
> If the DataSync service is using the role when you try to delete the resources, then the deletion might fail. If that happens, wait for a few minutes and try the operation again.

To delete DataSync resources used by the AWSServiceRoleForDataSync

1. Delete the DataSync agents used by the task (if there are any).
2. Delete the task's locations.
3. Delete the task.

Manually delete the service-linked role

Use the IAM console, the AWS CLI, or the AWS API to delete the AWSServiceRoleForDataSync service-linked role. For more information, see Deleting a service-linked role in the *IAM User Guide*.

Supported Regions for DataSync service-linked roles

DataSync supports using service-linked roles in all of the Regions where the service is available. For more information, see AWS Regions and endpoints.

Permissions for tagging DataSync resources during creation

Some resource-creating AWS DataSync API actions enable you to specify tags when you create the resource. You can use resource tags to implement attribute-based access control (ABAC). For more information, see What is ABAC for AWS? in the *IAM User Guide*.

To enable users to tag resources on creation, they must have permissions to use the action that creates the resource (such as `datasync:CreateAgent` or `datasync:CreateTask`). If tags are specified in the resource-creating action, users must also have explicit permissions to use the `datasync:TagResource` action.

The `datasync:TagResource` action is only evaluated if tags are applied during the resource-creating action. Therefore, a user that has permissions to create a resource (assuming there are no tagging conditions) doesn't require permissions to use the `datasync:TagResource` action if no tags are specified in the request.

However, if the user attempts to create a resource with tags, the request fails if the user doesn't have permissions to use the `datasync:TagResource` action.

Example IAM policy statements

Use the following example IAM policy statements to grant `TagResource` permissions to users creating DataSync resources.

The following statement allows users to tag a DataSync agent when they create the agent.

```
{
    "Version": "2012-10-17",
    "Statement": [
```

```
        {
            "Effect": "Allow",
            "Action": "datasync:TagResource",
            "Resource": "arn:aws:datasync:us-east-1:444455556666:agent/*"
        }
    ]
}
```

The following statement allows users to tag a DataSync location when they create the location.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "datasync:TagResource",
            "Resource": "arn:aws:datasync:us-east-1:111122223333:location/*"
        }
    ]
}
```

The following statement allows users to tag a DataSync task when they create the task.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "datasync:TagResource",
            "Resource": "arn:aws:datasync:us-east-1:444455556666:task/*"
        }
    ]
}
```

Cross-service confused deputy prevention

The confused deputy problem is a security issue where an entity that doesn't have permission to perform an action can coerce a more-privileged entity to perform the action. In AWS, cross-service impersonation can result in the confused deputy problem. Cross-service impersonation can occur when one service (the *calling service*) calls another service (the *called service*). The calling service can be manipulated to use its permissions to act on another customer's resources in a way it should

not otherwise have permission to access. To prevent this, AWS provides tools that help you protect your data for all services with service principals that have been given access to resources in your account.

We recommend using the `aws:SourceArn` and `aws:SourceAccount` global condition context keys in resource policies to limit the permissions that AWS DataSync gives another service to the resource. If you use both global condition context keys and the `aws:SourceArn` value contains the account ID, the `aws:SourceAccount` value and the account in the `aws:SourceArn` value must use the same account ID when used in the same policy statement. Use `aws:SourceArn` if you want only one resource to be associated with the cross-service access. Use `aws:SourceAccount` if you want any resource in that account to be associated with the cross-service use.

The value of `aws:SourceArn` must include the DataSync location ARN with which DataSync is allowed to assume the IAM role.

The most effective way to protect against the confused deputy problem is to use the `aws:SourceArn` key with the full ARN of the resource. If you don't know the full ARN or if you're specifying multiple resources, use wildcard characters (*) for the unknown portions. Here are some examples of how to do this for DataSync:

- To limit the trust policy to an existing DataSync location, include the full location ARN in the policy. DataSync will assume the IAM role only when dealing with that particular location.
- When creating an Amazon S3 location for DataSync, you don't know the location's ARN. In these scenarios, use the following format for the `aws:SourceArn` key: `arn:aws:datasync:`*`us-east-2`*`:`*`123456789012`*`:*`. This format validates the partition (`aws`), account ID, and Region.

The following full example shows how you can use the `aws:SourceArn` and `aws:SourceAccount` global condition context keys in a trust policy to prevent the confused deputy problem with DataSync.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "datasync.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
```

```
            "Condition": {
                "StringEquals": {
                "aws:SourceAccount": "123456789012"
                },
                "ArnLike": {
                "aws:SourceArn": "arn:aws:datasync:us-east-2:123456789012:*"
                }
            }
        }
    ]
}
```

For more example policies that show how you can use the `aws:SourceArn` and `aws:SourceAccount` global condition context keys with DataSync, see the following topics:

- Create a trust relationship that allows DataSync to access your Amazon S3 bucket
- Configure an IAM role to access your Amazon S3 bucket

Compliance validation for AWS DataSync

To learn whether an AWS service is within the scope of specific compliance programs, see AWS services in Scope by Compliance Program and choose the compliance program that you are interested in. For general information, see AWS Compliance Programs.

You can download third-party audit reports using AWS Artifact. For more information, see Downloading Reports in AWS Artifact.

Your compliance responsibility when using AWS services is determined by the sensitivity of your data, your company's compliance objectives, and applicable laws and regulations. For more information about your compliance responsibility when using AWS services, see AWS Security Documentation.

Resilience in AWS DataSync

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected with low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between Availability

Zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

> **Note**
>
> If an Availability Zone you're migrating data to or from does fail while you're running a DataSync task, the task also will fail.

For more information about AWS Regions and Availability Zones, see AWS global infrastructure.

Infrastructure security in AWS DataSync

As a managed service, AWS DataSync is protected by AWS global network security. For information about AWS security services and how AWS protects infrastructure, see AWS Cloud Security. To design your AWS environment using the best practices for infrastructure security, see Infrastructure Protection in *Security Pillar AWS Well-Architected Framework*.

You use AWS published API calls to access DataSync through the network. Clients must support the following:

- Transport Layer Security (TLS). We require TLS 1.2 and recommend TLS 1.3.
- Cipher suites with perfect forward secrecy (PFS) such as DHE (Ephemeral Diffie-Hellman) or ECDHE (Elliptic Curve Ephemeral Diffie-Hellman). Most modern systems such as Java 7 and later support these modes.

Securing storage location credentials with Secrets Manager

> **Note**
>
> Secrets Manager integration is available for object storage and Microsoft Azure Blob Storage.

DataSync uses locations to access your storage resources located on premises, in other clouds, or in AWS. Some location types require you to provide credentials, such as an access key and secret key or a user name and password, to authenticate with your storage system. When you create a

DataSync location that requires credentials for authentication, you can use AWS Secrets Manager (Secrets Manager) to store the secret for your credentials. The following options are available:

- Store the secret in Secrets Manager using a service-managed secret encrypted with a default key.
- Store the secret in Secrets Manager using a service-managed secret encrypted with an AWS KMS key that you manage.
- Store the secret in Secrets Manager using a secret and key that you create and manage. DataSync accesses this secret using an IAM role that you provide.

In all cases, the Secrets Manager secret is stored in your account, allowing you to update the secret as needed, independent of the DataSync service. Secrets created and managed by DataSync have the prefix `aws-datasync`.

You are charged for the use of secrets only when you create secrets outside of DataSync or make API calls to service-managed secrets from services other than DataSync.

Using a service-managed secret encrypted with a default key

When you create your DataSync location, you simply provide the secret string. DataSync creates a secret resource in Secrets Manager to store the secret you provide, and encrypts the secret with the default Secrets Manager KMS key for your account. You can change the secret value directly in Secrets Manager, or by updating the location using the DataSync console, AWS CLI, or SDK. When you delete the location resource or update it to use a custom secret, DataSync deletes the secret resource automatically.

> **Note**
>
> To create, modify, and delete secret resources in Secrets Manager, DataSync must have the appropriate permissions. For more information, see AWS managed policies for DataSync.

Using a service-managed secret encrypted with a custom AWS KMS key

When you create your DataSync location, you provide the secret and the ARN of your AWS KMS key. DataSync automatically creates a secret resource in Secrets Manager to store the secret you provide, and encrypts it using your AWS KMS key. You can change the secret value directly in Secrets Manager, or by updating the location using the DataSync console, AWS CLI, or SDK. When

you delete the location resource or update it to use a custom secret, DataSync deletes the secret resource automatically.

> **Note**
>
> Your AWS KMS key must use symmetric encryption with the ENCRYPT_DECRYPT key type. For more information, see Choosing a AWS Key Management Service key in the *AWS Secrets Manager User Guide*.

To create, modify, and delete secret resources in Secrets Manager, DataSync must have the appropriate permissions. For more information, see AWS managed policy: AWSDataSyncFullAccess.

In addition to using the correct DataSync managed policy, you also need the following permissions:

```
{
    "Sid": "DataSyncKmsPermissions",
    "Effect": "Allow",
    "Action": [
        "kms:Encrypt",
        "kms:GenerateDataKey",
        "kms:Decrypt"
    ],
    "Resource": "your-kms-key-arn",
    "Condition": {
        "StringLike": {
            "kms:ViaService": "secretsmanager.*.amazonaws.com"
        }
    }
}
```

Replace *your-kms-key-arn* with your KMS key ARN.

To retrieve and decrypt the secret value, DataSync uses a Service Linked Role (SLR) to access your AWS KMS key. To make sure DataSync can use your KMS key, add the following to the key's policy statement:

```
{
    "Sid": "Allow DataSync to use the key for decryption",
    "Effect": "Allow",
    "Principal": {
```

```
            "AWS": "arn:aws:iam::111122223333:role/aws-service-role/
datasync.amazonaws.com/AWSServiceRoleForDataSync"
        },
        "Action": "kms:Decrypt",
        "Resource": "*"
}
```

Replace *111122223333* with your AWS account ID.

Using a secret that you manage

Before you create your DataSync location, create a secret in Secrets Manager. The value for the secret must only contain the secret string itself in plain text. When you create your DataSync location, you provide the ARN of your secret and an IAM role that DataSync uses to access both your secret and the AWS KMS key used to encrypt your secret. To create an IAM role with the appropriate permissions, do the following:

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
3. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.
4. For **Use case**, choose **DataSync** from the drop-down list. Choose **Next**.
5. On the **Add permissions** page, choose **Next**. Enter a name for your role, and then choose **Create role**.
6. On the **Roles** page, search for the role that you just created and choose its name.
7. On the **Details** page for the role, choose the **Permissions** tab. Choose **Add permissions**, and then **Create inline policy**.
8. Choose the **JSON** tab and add the following permissions into the policy editor:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "secretsmanager:GetSecretValue",
                "secretsmanager:DescribeSecret"
            ],
```

```
            "Resource": "arn:aws:secretsmanager:us-east-1:111122223333:secret:your-
secret-name"
        }
    ]
}
```

Replace *your-secret-name* with the name of your Secrets Manager secret.

9. Choose **Next**. Enter a name for your policy, and then choose **Create policy**.
10. (Recommended) To prevent the cross-service confused deputy problem, do the following:

    a. On the **Details** page for the role, choose the **Trust relationships** tab. Choose **Edit trust policy**.

    b. Update the trust policy by using the following example, which includes the `aws:SourceArn` and `aws:SourceAccount` global condition context keys:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "datasync.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
            "Condition": {
                "StringEquals": {
                "aws:SourceAccount": "111122223333"
                },
                "ArnLike": {
                "aws:SourceArn": "arn:aws:datasync:us-east-1:111122223333:*"
                }
            }
        }
    ]
}
```

    c. Choose **Update policy**.

You can specify this role when creating your location. If your secret uses a customer-managed AWS KMS key for encryption, then you will also need to update the key's policy to allow access from the

role you created in the previous procedure. To update the policy, add the following to your AWS KMS key's policy statement:

```
{
    "Sid": "Allow DataSync use of the key",
    "Effect": "Allow",
    "Principal": {
        "AWS": "arn:aws:iam:111122223333:role/your-role-name”
    },
    "Action": "kms:Decrypt",
    "Resource": "*"
}
```

Replace *111122223333* with your AWS account ID, and *your-role-name* with the name of the IAM role you created in the previous procedure.

> **Note**
>
> When you store secrets in Secrets Manager, your AWS account incurs charges. For information about pricing, see AWS Secrets Manager Pricing.

AWS DataSync quotas

Find out about resource quotas and limits when working with AWS DataSync.

Storage system, file, and object limits

The following table describes the limits that DataSync has when working with storage systems, files, and objects.

Description	Limit
Maximum total file path length	4,096 bytes
Maximum file path component (file name, directory, or subdirectory) length	255 bytes
Maximum length of Windows domain	253 characters
Maximum length of server hostname	255 characters
Maximum Amazon S3 object name length	1,024 UTF-8 characters

DataSync quotas

The following table describes the quotas for DataSync resources in a specific AWS account and Region.

Resource	Quota	Adjustable
Maximum number of tasks you can create	100	Yes
(Enhanced mode tasks) Maximum number of source and destination objects that DataSync can work with per task execution For more information, see How DataSync transfers files, objects, and directories	Virtually unlimited	N/A

Resource	Quota	Adjustable
(Basic mode tasks) Maximum number of source and destination files, objects, and directories that DataSync can work with per task execution between on-premises, self-managed, or other cloud storage and AWS storage services For more information, see How DataSync transfers files, objects, and directories	50 million **Important** Remember the following about this quota: • If you transfer Amazon S3 objects with prefixes, the prefixes are treated as directories and count towards the quota. For example, DataSync would considers3://bucket/foo/bar.txt as two directories (./ and ./foo/) and one object (bar.txt). • If your task is working with more than 20 million files, objects, or directories, make sure that you allocate a minimum of 64 GB of RAM to your DataSync agent. For more information, see agent requireme	Yes **Tip** Instead of requestin g an increase, you can create tasks that focus on specific directori es using include and exclude filters. For more informati on, see filtering the data transferr

Resource	Quota	Adjustable
	nts for DataSync transfers.	ed by DataSync.

Resource	Quota	Adjustable
(Basic mode tasks) Maximum number of source and destination files, objects, and directories that DataSync can work with per task execution between AWS storage services For more information, see How DataSync transfers files, objects, and directories	25 million **Important** If you transfer Amazon S3 objects with prefixes, the prefixes are treated as directories and count towards the quota. For example, DataSync would considers3://bucket/foo/bar.txt as two directories (./ and ./foo/) and one object (bar.txt).	Yes **Tip** Instead of requesting an increase, you can create tasks that focus on specific directories using include and exclude filters. For more information, see filtering the data transferr

Resource	Quota	Adjustable
		ed by DataSync.
Maximum throughput per task (for transfers that use a DataSync agent)	10 Gbps	No
Maximum throughput per task (for transfers that don't use a DataSync agent)	5 Gbps	No
Maximum number of characters you can include in a task filter	102,400 characters **Note** If you're using the DataSync console, this limit includes all the characters combined in your include and exclude patterns.	No
Maximum number of queued executions for a single task	50	No
Maximum number of concurrent Enhanced mode task executions	120	No
Maximum number of days a task execution's history is retained	30	No
Maximum size for a manifest file with Enhanced mode tasks	20 GB	No

Request a quota increase

You can request an increase for some DataSync quotas. Increases aren't granted right away and might take a couple of days to take effect.

To request a quota increase

1. Open the Service Quotas console at https://console.aws.amazon.com/servicequotas/.
2. In the navigation pane, choose **AWS services** and then choose **AWS DataSync**.
3. Choose the quota that you want to increase, then choose **Request increase at account-level**.
4. Enter the total amount that you want the quota to be, then choose **Request**.

   If you need to increase a different quota, fill out a separate request.

Troubleshooting AWS DataSync issues

Use the following information to troubleshoot AWS DataSync issues and errors.

Topics

Troubleshooting issues with DataSync agents

Use the following information to help you troubleshoot issues with AWS DataSync agents. Some of these issues can include:

- Trouble connecting to an Amazon EC2 agent's local console
- Failing to retrieve an agent's activation key
- Issues activating an agent with a VPC service endpoint
- Discovering an agent is offline

How do I connect to an Amazon EC2 agent's local console?

To connect to an Amazon EC2 agent's local console, you must use SSH. Make sure that your EC2 instance's security group allows access with SSH (TCP port 22).

In a terminal, run the following `ssh` command to connect to the instance:

```
ssh -i /path/key-pair-name.pem instance-user-name@instance-public-ip-address
```

- For */path/key-pair-name*, specify the path and file name (`.pem`) of the private key required to connect to your instance.
- For *instance-user-name*, specify `admin`.

- For *instance-public-ip-address*, specify the public IP address of your instance.

What does the Failed to retrieve agent activation key error mean?

When activating your DataSync agent, the agent connects to the service endpoint that you specify to request an activation key. This error likely means that your network security settings are blocking the connection.

Action to take

If you're using a virtual private cloud (VPC) service endpoint, verify that your security group settings allow your agent to connect to the VPC endpoint. For information about required ports, see Network requirements for VPC or FIPS VPC service endpoints.

If you're using a public or Federal Information Processing Standard (FIPS) endpoint, check that your firewall and router settings allow your agent to connect to the endpoint. For information, see Network requirements for public or FIPS service endpoints.

I still can't activate an agent by using a VPC service endpoint

If you're still having issues activating a DataSync agent with a VPC service endpoint, see I don't know what's going on with my agent. Can someone help me?

What do I do if my agent is offline?

Your DataSync agent can be offline for a few reasons, but you might be able to get it back online. Before you delete the agent and create a new one, go through the following checklist to help you understand what might have happened.

- **Contact your backup team** – If your agent is offline because its virtual machine (VM) was restored from a snapshot or backup, you might need to replace the agent.
- **Check if the agent's VM or Amazon EC2 instance is off** – Depending on the type of agent that you're using, try turning the VM or EC2 instance back on if it's off. Once it's on again, test your agent's network connectivity to AWS.
- **Verify your agent meets the minimum hardware requirements** – Your agent might be offline because its VM or EC2 instance configuration was accidentally changed since the agent was activated. For example, if your VM no longer has the minimum required memory or space, the agent might appear as offline. For more information, see Requirements for AWS DataSync agents.

- **Wait for agent-related software updates to finish** – Your agent might go offline briefly following software updates provided by AWS. If you believe this is why the agent is offline, wait a short period then check if the agent is back online.
- **Check your VPC service endpoint settings** – If your offline agent is using a public service endpoint and also in the same VPC where you created a VPC service endpoint for DataSync, you might need to disable private DNS support for that VPC endpoint.

If none of these seem to be the reason that the agent is offline, you likely need to replace the agent.

I don't know what's going on with my agent. Can someone help me?

You can allow AWS Support to access your DataSync agent and help troubleshoot agent-related issues. You must enable this access through the agent's local console.

To provide Support access to your agent

1. Log in to your agent's local console.
2. At the prompt, enter **5** to open the command prompt (for VMware VMs, use **6**).
3. Enter **h** to open the **AVAILABLE COMMANDS** window.
4. In the **AVAILABLE COMMANDS** window, enter the following to connect to Support:

   ```
   open-support-channel
   ```

   If you are using the agent with VPC endpoints, you must provide a VPC endpoint IP address for your support channel, as follows:

   ```
   open-support-channel vpc-ip-address
   ```

   Your firewall must allow the inbound TCP port 22 to initiate a support channel to AWS. When you connect to Support, DataSync assigns you a support number. Make a note of your support number.

   > **Note**
   >
   > The channel number isn't a TCP/UDP port number. Instead, it makes an SSH (TCP 22) connection to servers and provides the support channel for the connection.

5. When the support channel is established, provide your support service number to Support so that they can provide troubleshooting assistance.
6. When the support session is finished, press **`Enter`** to end it.
7. Enter **`exit`** to log out of the DataSync local console.
8. Follow the prompts to exit the local console.

Troubleshooting issues with DataSync locations

Use the following information to help you troubleshoot issues with AWS DataSync locations. Some of these issues can include:

- Permissions and mount errors with NFS locations
- File ownership issues
- Problems accessing SMB locations that use Kerberos authentication
- Permission and access issues with object storage, such as Amazon S3 and Microsoft Azure Blob locations

My task failed with an NFS permissions denied error

You can get a "permissions denied" error message if you configure your NFS file server with `root_squash` or `all_squash` and your files don't all have read access.

Action to take

To fix this issue, configure your NFS export with `no_root_squash` or make sure that the permissions for all of the files that you want to transfer allow read access for all users.

For DataSync to access directories, you must also enable all-execute access. To make sure that the directory can be mounted, first connect to any computer that has the same network configuration as your agent. Then run the following CLI command:

```
mount -t nfs -o nfsvers=<your-nfs-server-version> <your-nfs-server-name>:<nfs-export-path-you-specified> <new-test-folder-on-your-computer>
```

If the issue still isn't resolved, contact AWS Support Center.

My task failed with an NFS mount error

You might see the following error when running a DataSync task that involves an NFS file server location:

Task failed to access location loc-1111222233334444a: x40016: mount.nfs: Connection timed out

Actions to take

Do the following until the error is resolved.

1. Make sure that the NFS file server and export that you specify in your DataSync location are valid. If they aren't, delete your location and task, then create a new location and task that use a valid NFS file server and export. For more information, see Using the DataSync console.
2. Check your firewall configuration between your agent and NFS file server. For more information, see Network requirements for on-premises, self-managed, and other cloud storage.
3. Make sure that your agent can access the NFS file server and mount the export. For more information, see Providing DataSync access to NFS file servers.
4. If you still see the error, open a support channel with Support. For more information, see I don't know what's going on with my agent. Can someone help me?.

My task failed with an Amazon EFS mount error

You might see the following error when running a DataSync task that involves an Amazon EFS location:

Task failed to access location loc-1111222233334444a: x40016: Failed to connect to EFS mount target with IP: 10.10.1.0.

This can happen if the Amazon EFS file system's mount path that you configure with your location gets updated or deleted. DataSync isn't aware of these changes in the file system.

Action to take

Delete your location and task and create a new Amazon EFS location with the new mount path.

File ownership isn't maintained with NFS transfer

After your transfer, you might notice that the files in your DataSync destination location have different user IDs (UIDs) or group IDs (GIDs) than the same files in your source location. For example, the files in your destination might have a UID of 65534, 99, or nobody.

This can happen if a file system involved in your transfer uses NFS version 4 ID mapping, a feature that DataSync doesn't support.

Action to take

You have a couple options to work around this issue:

- Create a new location for the file system that uses NFS version 3 instead of version 4.
- Disable NFS version 4 ID mapping on the file system.

Retry the transfer. Either option should resolve the issue.

My task can't access an SMB location that uses Kerberos

DataSync errors with SMB locations that use Kerberos authentication are typically related to mismatches between your location and Kerberos configurations. There also might be a network issue.

Failed to access location

The following error indicates that there might be configuration issues with your SMB location or Kerberos setup:

```
Task failed to access location
```

Verify the following:

- The SMB file server that you specify for your location is a domain name. For Kerberos, you can't specify the file server's IP address.
- The Kerberos principal that you specify for your location matches the principal that you use to create the Kerberos key table (keytab) file. Principal names are case sensitive.
- The Kerberos principal's mapped user password hasn't changed since you created the keytab file. If the password changes (because of password rotation or some other reason), your task execution might fail with the following error:

Task failed to access location loc-1111222233334444a: x40015: kinit: Preauthentication failed while getting initial credentials

Can't contact KDC realm

The following error indicates a networking issue:

```
kinit: Cannot contact any KDC for realm 'MYDOMAIN.ORG' while getting initial
 credentials"
```

Verify the following:

- The Kerberos configuration file (`krb5.conf`) that you provided DataSync has the correct information about your Kerberos realm. For an example `krb5.conf` file, see Kerberos authentication prerequisites.
- The Kerberos Key Distribution Center (KDC) server port is open. The KDC port is typically TCP port 88.
- The DNS configuration on your network.

My task failed with an input/output error

You can get an input/output error message if your storage system fails I/O requests from the DataSync agent. Common reasons for this include a server disk failure, changes to your firewall configuration, or a network router failure.

If the error involves an NFS file server or Hadoop Distributed File System (HDFS) cluster, use the following steps to resolve the error.

Actions to take (NFS)

First, check your NFS file server's logs and metrics to determine if the problem started on the NFS server. If yes, resolve that issue.

Next, check that your network configuration hasn't changed. To check if the NFS file server is configured correctly and that DataSync can access it, do the following:

1. Set up another NFS client on the same network subnet as the agent.
2. Mount your share on that client.
3. Validate that the client can read and write to the share successfully.

Actions to take (HDFS)

Do the following until you resolve the error:

1. Make sure that your HDFS cluster allows your DataSync agent to communicate with the cluster's NameNode and DataNode ports.

   In most clusters, you can find the port numbers that the cluster uses in the following configuration files:

   - To find the NameNode port, look in the `core-site.xml` file under the `fs.default` or `fs.default.name` property (depending on the Hadoop distribution).
   - To find the DataNode port, look in the `hdfs-site.xml` file under the `dfs.datanode.address` property.
2. In your `hdfs-site.xml` file, verify that your `dfs.data.transfer.protection` property has only one value. For example:

   ```
   <property>
      <name>dfs.data.transfer.protection</name>
      <value>privacy</value>
   </property>
   ```

Error: `FsS3UnableToConnectToEndpoint`

DataSync can't connect to your Amazon S3 location. This could mean the location's S3 bucket isn't reachable or the location isn't configured correctly.

Do the following until you resolve the issue:

- Check if DataSync can access your S3 bucket.
- Make your sure location is configured correctly by using the DataSync console or DescribeLocationS3 operation.

Error: `FsS3HeadBucketFailed`

DataSync can't access the S3 bucket that you're transferring to or from. Check if DataSync has permission to access the bucket by using the Amazon S3 HeadBucket operation. If you need to adjust your permissions, see Providing DataSync access to S3 buckets.

Task fails with an `Unable to list Azure Blobs on the volume root` error

If your DataSync transfer task fails with an `Unable to list Azure Blobs on the volume root` error, there might be an issue with your shared access signature (SAS) token or your Azure storage account's network.

Actions to take

Try the following and run your task again until you fix the issue:

- Make sure that your SAS token has the right permissions to access your Microsoft Azure Blob Storage.
- If you're running your DataSync agent in Azure, configure your storage account to allow access from the virtual network where your agent resides.
- If you're running your agent on Amazon EC2, configure your Azure storage firewall to allow access from the agent's public IP address.

For information on how to configure your Azure storage account's network, see the Azure Blob Storage documentation.

Error: `FsAzureBlobVolRootListBlobsFailed`

The shared access signature (SAS) token that DataSync uses to access your Microsoft Azure Blob Storage doesn't have the List permission.

To resolve the issue, update your location with a token that has the List permission and try running your task again.

Error: `SrcLocHitAccess`

DataSync can't access your source location. Check that DataSync has permission to access the location and try running your task again.

Error: `SyncTaskErrorLocationNotAdded`

DataSync can't access your location. Check that DataSync has permission to access the location and try running your task again.

Error: S3 location creation failed with (InvalidRequestException) when calling the CreateLocationS3 operation

This error could be related to IAM permissions, Amazon S3 bucket policies, AWS KMS permissions or other permission issues. If you get this error, use the following information to troubleshoot:

- Troubleshoot access denied (403 Forbidden) errors in Amazon S3 in the *Amazon Simple Storage Service User Guide*
- How do I troubleshoot 403 Access Denied errors from Amazon S3? on AWS re:Post

Task with S3 source location fails with HeadObject or GetObjectTagging error

Errors related to HeadObject or GetObjectTagging

If you're transferring objects with specific version IDs from an S3 bucket, you might see an error related to `HeadObject` or `GetObjectTagging`. For example, here's an error related to `GetObjectTagging`:

```
[WARN] Failed to read metadata for file /picture1.png (versionId: 111111): S3 Get
 Object Tagging Failed
[ERROR] S3 Exception: op=GetObjectTagging photos/picture1.png, code=403, type=15,
 exception=AccessDenied,
msg=Access Denied req-hdrs: content-type=application/xml, x-amz-api-version=2006-03-01
 rsp-hdrs: content-type=application/xml,
date=Wed, 07 Feb 2024 20:16:14 GMT, server=AmazonS3, transfer-encoding=chunked,
x-amz-id-2=IOWQ4fDEXAMPLEQM+ey7N9WgVhSnQ6JEXAMPLEZb7hSQDASK+Jd1vEXAMPLEa3Km, x-amz-
request-id=79104EXAMPLEB723
```

If you see either of these errors, validate that the IAM role that DataSync uses to access your S3 source location has the following permissions:

- `s3:GetObjectVersion`
- `s3:GetObjectVersionTagging`

If you need to update your role with these permissions, see Creating an IAM role for DataSync to access your Amazon S3 location.

Troubleshooting issues with DataSync tasks

Use the following information to help you troubleshoot issues with AWS DataSync tasks and task executions. These issues might include task setup problems, stuck task executions, and data not transferring as expected.

Error: Invalid SyncOption value. Option: TransferMode,PreserveDeletedFiles, Value: ALL,REMOVE.

This error occurs when you're creating or editing your DataSync task and you select the **Transfer all data** option and deselect the **Keep deleted files** option.

When you transfer all data, DataSync doesn't scan your destination location and doesn't know what to delete.

Task execution fails with an EniNotFound error

This error occurs if you delete one of your task's network interfaces in your virtual private cloud (VPC). If your task is scheduled or queued, the task will fail if it's missing a network interface required to transfer your data.

Actions to take

You have the following options to work around this issue:

- Manually restart the task. When you do this, DataSync will create any missing network interfaces it needs to run the task.
- If you need to clean up resources in your VPC, make sure that you don't delete network interfaces related to a DataSync task that you're still using.

  To see the network interfaces allocated to your task, do one of the following:

  - Use the DescribeTask operation. You can view the network interfaces in the `SourceNetworkInterfaceArns` and `DestinationNetworkInterfaceArns` response elements.
  - In the Amazon EC2 console, search for your task ID (such as `task-f012345678abcdef0`) to find its network interfaces.

- Consider not running your tasks automatically. This could include disabling task queueing or scheduling (through DataSync or custom automation).

Task execution fails with a Cannot allocate memory error

When your DataSync task fails with a Cannot allocate memory error, it can mean a few different things.

Action to take

Try the following until you no longer see the issue:

- If your transfer involves an agent, make sure that the agent meets the virtual machine (VM) or Amazon EC2 instance requirements.
- Split your transfer into multiple tasks by using filters. It's possible that you're trying to transfer more files or objects than what one DataSync task can handle.
- If you still see the issue, contact Support.

Task fails with `Input/Output error` for FSx for ONTAP file system

When your DataSync task fails with an `Input/Output error` when transferring data with an FSx for ONTAP file system, it can be due to one or more of the following issues.

The FSx for ONTAP volume has reached its maximum file capacity

This error occurs when the number of available inodes, or file pointers, on a volume is exhausted.

Actions to take

First, view the volume's maximum file capacity. Then, increase the volume's file capacity by either increasing the number of inodes or by increasing the storage capacity. For more information, see Increasing a volume's maximum file capacity in the *FSx for ONTAP User Guide*.

The FSx for ONTAP volume has run out of available storage capacity

This error occurs when the volume doesn't have available storage capacity.

Actions to take

First, determine the volume's available storage capacity. Then, increase the volume's storage capacity. For more information, see Increasing a volume's storage capacity in the *FSx for ONTAP User Guide*.

> **Note**
>
> To automatically increase the volume's storage capacity when needed, see Using volume autosizing in the *FSx for ONTAP User Guide*.

The FSx for ONTAP directory has reached the maximum number of files that can be stored in each directory

This error occurs when you have reached the maximum number of files that can be stored in each directory.

Action to take

Increase the max directory size to support larger directories. For more information, see Best practices for using the FSx for ONTAP maximum directory size in *AWS Prescriptive Guidance*.

The DataSync task execution generated too much read write concurrency, consuming a high percentage of the file system's throughput capacity

This error occurs when the DataSync task execution is consuming too much of your file system's available throughput capacity.

Actions to take

First, determine whether the task execution was consuming too much of the file system's throughput capacity using the following methods:

- Monitor the file system's performance using the available CloudWatch metrics. For more information, see Monitoring file system metrics in the *FSx for ONTAP User Guide*.
- Monitor the file system for file server performance warnings in the Amazon FSx console. For more information, see Performance warnings and recommendations in the *FSx for ONTAP User Guide*.

Then, make sure that the task doesn't use all of the file system's available throughput capacity by doing one of the following:

- Set the task execution's bandwidth limit to an amount that is less than the FSx for ONTAP file system's provisioned throughput capacity. For more information, see Setting bandwidth limits for your AWS DataSync task.
- Increase the file system's provisioned throughput capacity. For more information, see Updating throughput capacity in the *FSx for ONTAP User Guide*.

Task fails with `Connection Reset by peer` or `Host is down` message for FSx for ONTAP file system

If your DataSync task fails with a `Connection Reset by peer` or `Host is down` message when transferring data with an FSx for ONTAP file system, it can be due to one or more of the following issues:

- The file system's SMB server was rebooted or otherwise disconnected during the task execution.
- The file system failed over from the primary to secondary server (and IP address) during task execution. DataSync does not support failing over to a secondary IP address during task execution.

  FSx for ONTAP file systems failover to a secondary server and IP address during the following events:

  - The primary server becomes unavailable.
  - The primary server's Availability Zone becomes unavailable (for Multi-AZ file systems).
  - During a user-initiated throughput capacity change.
  - During the file system's regularly scheduled maintenance window.

  For more information, see FSx for ONTAP Failover process in the FSx for ONTAP User Guide.

Action to take

Restart the task.

Task execution has a launching status but nothing seems to be happening

Your DataSync task can get stuck with a **Launching** status typically because the agent is powered off or has lost network connectivity.

Actions to take

Make sure that your agent's status is **ONLINE**. If the agent is **OFFLINE**, make sure it's powered on.

If the agent is powered on and the task is still **Launching**, then there's likely a network connection problem between your agent and AWS. For information about how to test network connectivity, see Verifying your agent's connection to the DataSync service.

If you're still having this issue, see I don't know what's going on with my agent. Can someone help me?.

Task execution seems stuck in the preparing status

The amount of time your DataSync transfer task has the **Preparing** status depends on the amount of data in your transfer source and destination and the performance of those storage systems.

When a task starts, DataSync performs a recursive directory listing to discover all files, objects, directories, and metadata in your source and destination. DataSync uses these listings to identify differences between storage systems and determine what to copy. This process can take a few minutes or even a few hours.

Action to take

You shouldn't have to do anything. Continue to wait for the task status to change to **Transferring**. If the status still doesn't change, contact AWS Support Center.

Task execution stops before the transfer finishes

If your DataSync task execution stops early, your task configuration might include an AWS Region that's disabled in your AWS account.

Actions to take

Do the following to run your task again:

1. Check the opt-in status of your task's Regions and make sure they're enabled.
2. Start the task again.

Task execution fails when transferring from a Google Cloud Storage bucket

Because DataSync communicates with Google Cloud Storage by using the Amazon S3 API, there's a limitation that might cause your DataSync transfer to fail if you try to copy object tags. The following message related to the issue appears in your CloudWatch logs:

[WARN] Failed to read metadata for file /*your-bucket*/*your-object*: S3 Get Object Tagging Failed: proceeding without tagging

To prevent this, deselect the **Copy object tags** option when configuring your transfer task settings.

There are mismatches between task execution's timestamps

When looking at the DataSync console or Amazon CloudWatch logs, you might notice that the start and end times for your DataSync task execution don't match the timestamps you see in other monitoring tools. This is because the console and CloudWatch logs take into account the time a task execution spends in the launching or queueing states, while some other tools don't.

You might notice this discrepancy when comparing execution timestamps between the DataSync console or CloudWatch logs and the following places:

- Logs for the file system involved in your transfer
- The last modified date on an Amazon S3 object that DataSync wrote to
- Network traffic coming from the DataSync agent
- Amazon EventBridge events

Task execution fails with `NoMem` error

The set of data you're trying to transfer may be too large for DataSync. If you see this error, contact AWS Support Center.

Task execution fails with `FsNfsIdMappingEnabled` error

DataSync does not support NFSv4 ID mapping. To work around this, configure your NFS location to use NFSv3.

Object fails to transfer to Azure Blob Storage with `user metadata` key error

When transferring from an S3 bucket to Azure Blob Storage, you might see the following error:

```
[ERROR] Failed to transfer file /user-metadata/file1: Azure Blob user metadata key must
 be a CSharp identifier
```

This means that */user-metadata/file1* includes user metadata that doesn't use a valid C# identifier. For more information, see the Microsoft documentation.

There's an `/.aws-datasync` folder in the destination location

DataSync creates a folder called `/.aws-datasync` in your destination location to help facilitate your data transfer.

While DataSync typically deletes this folder following your transfer, there might be situations where this doesn't happen.

Action to take

Delete this folder anytime as long as you don't have a running task execution copying to that location.

Can't transfer symbolic links between locations using SMB

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Selected files transferred except for files
 skipped due to errors. If no skipped files are listed in Cloud Watch Logs, please
 contact AWS Support for further assistance.
```

When transferring between SMB storage systems (such as an SMB file server and Amazon FSx for Windows File Server file system), you might see the following warnings and errors in your CloudWatch logs:

```
[WARN] Failed to read metadata for file /appraiser/symlink: No data available
[ERROR] Failed to read metadata for directory /appraiser/symlink: No data available
```

Action to take

DataSync doesn't support transferring symbolic links (or hard links) when transferring between these location types. For more information, see Links and directories copied by AWS DataSync.

Task report errors

You might run into one of the following errors while trying to monitor your DataSync transfer with a task report.

Error message	Workaround
File path exceeds the maximum length of 4,096 characters. Cannot write to Task Report	None. DataSync can't transfer a file with a path that exceeds 4,096 bytes. For more information, see Storage system, file, and object limits.
Failed to upload Task Report(s) to S3 due to an invalid bucket or IAM role	Check that the DataSync IAM role has the right permissions to upload a task report to your S3 bucket.
Execution error occurred prior to generating any Task Reports	Check your CloudWatch logs to identify why your task execution failed.

Troubleshooting data verification issues

By default, AWS DataSync verifies the integrity of your data at the end of a transfer. Use the following information to help you diagnose common verification errors and warnings, such as files being modified or deleted before DataSync finishes verifying your data.

With verification issues, many times it helps to review your CloudWatch logs (or task reports) in addition to the task execution error that you're seeing. DataSync provides JSON-structured logs for Enhanced mode tasks, while Basic mode tasks have unstructured logs.

There are mismatches between a file's contents

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Verification detected mismatches. Files with
 mismatches are listed in Cloud Watch Logs
```

In your CloudWatch logs, you might notice failed verifications for contents that differ between the source and destination locations. This can happen if files are modified during your transfer.

For example, the following logs shows that `file1.txt` has different `mtime`, `srcHash`, and `dstHash` values:

Basic mode log example

```
[NOTICE] Verification failed <> /directory1/directory2/file1.txt
[NOTICE] /directory1/directory2/file1.txt   srcMeta: type=R mode=0755 uid=65534
 gid=65534 size=534528 atime=1633100003/684349800 mtime=1602647222/222919600
 extAttrsHash=0
[NOTICE]   srcHash: 0c506c26bd1e43bd3ac346734f1a9c16c4ad100d1b43c2903772ca894fd24e44
[NOTICE] /directory1/directory2/file1.txt   dstMeta: type=R mode=0755 uid=65534
 gid=65534 size=511001 atime=1633100003/684349800 mtime=1633106855/859227500
 extAttrsHash=0
[NOTICE]   dstHash: dbd798929f11a7c0201e97f7a61191a83b4e010a449dfc79fbb8233801067c46
```

In DataSync, `mtime` represents the last time a file was written to before preparation. When verifying transfers, DataSync compares `mtime` values between source and destination locations. A verification failure like this occurs if the `mtime` for a file isn't the same for both locations. The differences between `srcHash` and `dstHash` indicate the file's contents don't match at both locations.

Actions to take

Do the following:

1. Use an epoch time converter to determine whether the source or destination file or object was modified more recently. This can help identify which version is current.
2. To avoid this error again, schedule your task to run during a maintenance window when there's no activity at your source and destination.

There's a mismatch between a file's SMB metadata

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Verification detected mismatches. Files with
 mismatches are listed in Cloud Watch Logs
```

When transferring between storage systems that support the Server Message Block (SMB) protocol, you might see this error when a file's extended SMB attributes don't match between source and destination.

For example, the following logs show that `file1.txt` has a different `extAttrsHash` value between locations, indicating the file contents are identical but extended attributes weren't set at the destination:

Basic mode log example

```
[NOTICE] Verification failed <> /directory1/directory2/file1.txt
[NOTICE] /directory1/directory2/file1.txt   srcMeta: type=R mode=0755 uid=65534
 gid=65534 size=1469752 atime=1631354985/174924200 mtime=1536995541/986211400
 extAttrsHash=2272191894
[NOTICE]   srcHash: 38571d42b646ac8f4034b7518636b37dd0899c6fc03cdaa8369be6e81a1a2bb5
[NOTICE] /directory1/directory2/file1.txt   dstMeta: type=R mode=0755 uid=65534
 gid=65534 size=1469752 atime=1631354985/174924200 mtime=1536995541/986211400
 extAttrsHash=3051150340
[NOTICE]   dstHash: 38571d42b646ac8f4034b7518636b37dd0899c6fc03cdaa8369be6e81a1a2bb5
```

You might also see a related error message about extended attributes:

```
[ERROR] Deferred error: WriteFileExtAttr2 failed to setextattrlist(filename="/
directory1/directory2/file1.txt"): Input/output error
```

Action to take

This error typically occurs when there are insufficient permissions to copy access control lists (ACLs) to the destination. To resolve this issue, review the following configuration guides based on your destination type:

- Required permissions with FSx for Windows File Server file systems
- Required permissions with FSx for ONTAP file systems that use SMB

Files to transfer are no longer at source location

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Selected files transferred except for files
 skipped due to errors. If no skipped files are listed in Cloud Watch Logs, please
 contact AWS Support for further assistance.
```

In your logs, you might see errors indicating that files aren't at the source location. This can happen if files (such as `file1.dll` and `file2.dll`) are deleted after preparation but before DataSync transfers them:

Basic mode log example

```
[ERROR] Failed to open source file /file1.dll: No such file or directory
[ERROR] Failed to open source file /file2.dll: No such file or directory
```

Action to take

To avoid these situations, schedule your task to run when there's no activity at the source location.

For example, you can run your task during a maintenance window when users and applications aren't actively working with that location.

In some cases, you might not see logs associated with this error. If that happens, contact AWS Support Center.

DataSync can't verify destination data

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Verification detected mismatches. Files with
 mismatches are listed in Cloud Watch Logs
```

In your logs, you might notice that DataSync can't verify certain folders or files in the destination location. These errors can look like this:

Basic mode log example

```
[ERROR] Failed to read metadata for destination file /directory1/directory2/
file1.txt: No such file or directory
```

For files, you might see verification failures like this:

Basic mode log example

```
[NOTICE] Verification failed <> /directory1/directory2/file1.txt
[NOTICE] /directory1/directory2/file1.txt   srcMeta: type=R mode=0755 uid=65534
 gid=65534 size=61533 atime=1633099987/747713800 mtime=1536995631/894267700
 extAttrsHash=232104771
[NOTICE]   srcHash: 1426fe40f669a7d36cca1b5329983df31a9aeff8eb9fe3ac885f26de2f8fff6b
[NOTICE] /directory1/directory2/file1.txt   dstMeta: type=R mode=0755 uid=65534
 gid=65534 size=0 atime=0/0 mtime=0/0 extAttrsHash=0
[NOTICE]   dstHash: 0000000000000000000000000000000000000000000000000000000000000000
```

Action to take

These logs indicate that destination data was deleted after the transfer but before verification. (Logs look similar when data is uploaded to a source location during the same time frame.)

To avoid these situations, schedule your task to run when there's no activity at the destination location.

For example, you can run your task during a maintenance window when users and applications aren't actively working with that location.

DataSync can't read object metadata

When your task execution finishes, you see the following error:

```
Transfer and verification completed. Selected files transferred except for files
 skipped due to errors. If no skipped files are listed in Cloud Watch Logs, please
 contact AWS Support for further assistance.
```

In your logs, you might notice that DataSync can't read `file1.png` because of a failed Amazon S3 `HeadObject` request. DataSync makes `HeadObject` requests with S3 locations during task preparation and verification.

Basic mode log example

```
[WARN] Failed to read metadata for file /file1.png: S3 Head Object Failed
```

Actions to take

To fix this issue, verify whether DataSync has the right level of permissions to work with your S3 bucket:

- Make sure that the IAM role that DataSync uses to access your Amazon S3 locations allows the `s3:GetObject` permission. For more information, see Required permissions.
- If your S3 bucket uses server-side encryption, make sure that DataSync is allowed to access the objects in that bucket. For more information, see Accessing S3 buckets using server-side encryption.

There's a mismatch in an object's system-defined metadata

When your Enhanced mode task execution between S3 buckets finishes, you see the following error:

```
Verification failed due to a difference in metadata
```

You might notice in your logs a mismatch in an object's Amazon S3 system-defined metadata. In this particular example, the source object doesn't have `Content-Type` metadata but the destination object does. This happened because the destination S3 bucket automatically applied `"ContentType": "application/octet-stream"` metadata to the object when DataSync transferred it there.

Enhanced mode log example

```
{
    "Action": "VERIFY",
    "Source": {
        "LocationId": "loc-0b3017fc4ba4a2d8d",
        "RelativePath": "encoding/content-null",
        "Metadata": {
            "Type": "Object",
            "ContentSize": 24,
            "LastModified": "2024-12-23T15:48:15Z",
```

```
            "S3": {
                "SystemMetadata": {
                    "ETag": "\"68b9c323bb846841ee491481f576ed4a\""
                },
                "UserMetadata": {},
                "Tags": {}
            }
        }
    },
    "Destination": {
        "LocationId": "loc-abcdef01234567890",
        "RelativePath": "encoding/content-null",
        "Metadata": {
            "Type": "Object",
            "ContentSize": 24,
            "LastModified": "2024-12-23T16:00:03Z",
            "S3": {
                "SystemMetadata": {
                    "ContentType": "application/octet-stream",
                    "ETag": "\"68b9c323bb846841ee491481f576ed4a\""
                },
                "UserMetadata": {
                    "file-mtime": "1734968895000"
                },
                "Tags": {}
            }
        }
    },
    "TransferType": "CONTENT_AND_METADATA",
    "ErrorCode": "MetadataDiffers",
    "ErrorDetail": "Verification failed due to a difference in metadata"
}
```

Action to take

To avoid this error, update your source location objects to include the `Content-Type` metadata property.

Understanding data verification duration

DataSync verification includes an SHA256 checksum on file content and an exact comparison of file metadata between locations. How long verification takes depends on several factors,

including the number of files or objects involved, the size of the data in the storage systems, and the performance of these systems.

Action to take

Given the factors that can affect verification time, you shouldn't have to do anything. However, if your task execution seems stuck with a verifying status, contact AWS Support Center.

Troubleshooting higher than expected S3 storage costs with DataSync

If your Amazon S3 storage costs are higher than you thought they would be following an AWS DataSync transfer, it might be due to one or more of the following reasons:

- When transferring to or from S3 buckets, you incur costs related to S3 API requests made by DataSync.
- DataSync uses the Amazon S3 multipart upload feature to upload objects to S3 buckets. This approach can result in unexpected storage charges for uploads that don't complete successfully.
- DataSync copies object tags from source and destination objects when **Copy object tags** is enabled on the console or `ObjectTags` is set to `PRESERVE`. Copying of these object tags can incur S3 API request costs.
- Object versioning might be enabled on your S3 bucket. Object versioning results in Amazon S3 storing multiple copies of objects that have the same name.

Actions to take

In these cases, you can take the following steps:

- Make sure you understand how DataSync uses S3 requests and how they might be affecting your storage costs. For more information, see Evaluating S3 request costs when using DataSync.
- If the issue is related to multipart uploads, configure a policy for multipart uploads for your S3 bucket to clean up incomplete multipart uploads to reduce storage cost. For more information, see the AWS blog post S3 Lifecycle Management Update - Support for Multipart Uploads and Delete Markers.
- If the issue is related to copying object tags and you don't need object tags, clear the **Copy object tags** checkbox in the DataSync console or set `ObjectTags` to `None` when creating, starting, or updating a task.

- If the issue is related to object versioning, disable object versioning on your S3 bucket.

f you need additional help, contact AWS Support Center.

AWS DataSync tutorials

These tutorials walk you through some real-world scenarios with AWS DataSync.

Topics

Tutorial: Transferring data from on-premises storage to Amazon S3 across AWS accounts

When using AWS DataSync with on-premises storage, you typically transfer data to an AWS storage service that belongs to the same AWS account as your DataSync agent. There are situations, however, where you might need to transfer data to an Amazon S3 bucket that's associated with a different account.

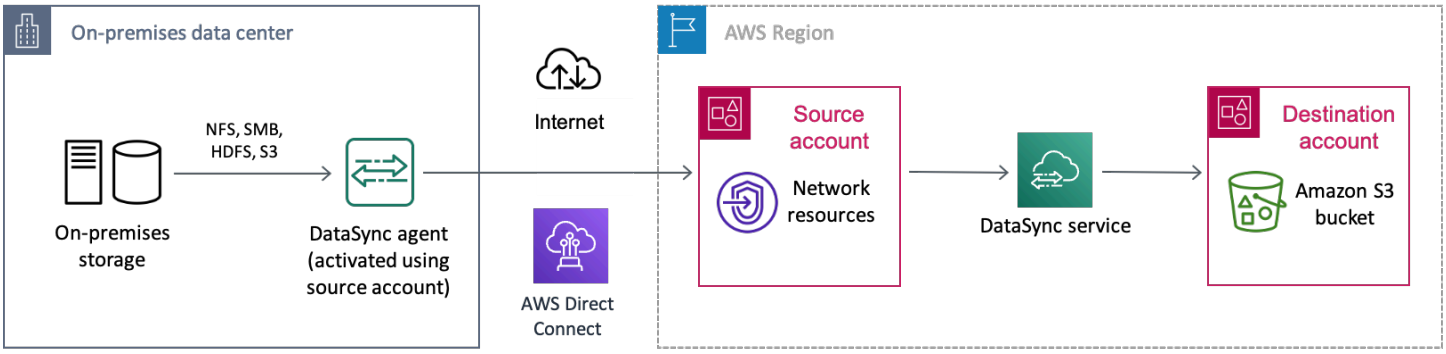
> **Important**
>
> Transferring data across AWS accounts by using the methods in this tutorial works only when Amazon S3 is one of the DataSync transfer locations.

Overview

It's not uncommon to need to transfer data between different AWS accounts, especially if you have separate teams managing your organization's resources. Here's what a cross-account transfer using DataSync can look like:

- **Source account**: The AWS account for managing network resources. This is the account that you activate your DataSync agent with.
- **Destination account**: The AWS account for managing the S3 bucket that you need to transfer data to.

The following diagram illustrates this kind of scenario.



Prerequisite: Required source account permissions

For your source AWS account, there are two sets of permissions to consider with this kind of cross-account transfer:

- *User permissions* that allow a user to work with DataSync (this might be you or your storage administrator). These permissions let you create DataSync locations and tasks.
- *DataSync service permissions* that allow DataSync to transfer data to your destination account bucket.

User permissions

In your source account, add at least the following permissions to an IAM role for creating your DataSync locations and task. For information on how to add permissions to a role, see creating or modifying an IAM role.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "SourceUserRolePermissions",
            "Effect": "Allow",
            "Action": [
                "datasync:CreateLocationS3",
                "datasync:CreateTask",
                "datasync:DescribeLocation*",
                "datasync:DescribeTaskExecution",
                "datasync:ListLocations",
                "datasync:ListTaskExecutions",
                "datasync:DescribeTask",
                "datasync:CancelTaskExecution",
```

```
                "datasync:ListTasks",
                "datasync:StartTaskExecution",
                "s3:GetBucketLocation",
                "s3:ListAllMyBuckets"
            ],
            "Resource": "*"
        },
        {
            "Sid": "IAMPermissions",
            "Effect": "Allow",
            "Action": [
                "iam:CreateRole",
                "iam:ListRoles",
                "iam:CreatePolicy"
            ],
            "Resource": "arn:aws:iam::111122223333:role/DataSync-*"
        },
        {
            "Sid": "IAMAttachRolePermissions",
            "Effect": "Allow",
            "Action": [
                "iam:AttachRolePolicy"
            ],
            "Resource": "arn:aws:iam::111122223333:role/DataSync-*",
            "Condition": {
            "ArnLike": {
                "iam:PolicyARN": [
                   "arn:aws:iam::111122223333:policy/DataSync-*",
                   "arn:aws:iam::aws:policy/AmazonS3ReadOnlyAccess",
                   "arn:aws:iam::aws:policy/service-role/AWSDataSyncFullAccess"
                ]
            }
          }
        },
        {
            "Effect": "Allow",
            "Action": [
                "iam:PassRole"
            ],
            "Resource": "*",
            "Condition": {
                "StringEquals": {
                    "iam:PassedToService": [
                        "datasync.amazonaws.com"
```

```
                    ]
                }
            }
        }
    ]
}
```

> **Tip**
>
> To set up your *user permissions*, consider using AWSDataSyncFullAccess. This is an AWS managed policy that provides a user full access to DataSync and minimal access to its dependencies.

DataSync service permissions

The DataSync service needs the following permissions in your source account to transfer data to your destination account bucket.

Later in this tutorial, you add these permissions when creating an IAM role for DataSync. You also specify this role (*source-datasync-role*) in your destination bucket policy and when creating your DataSync destination location.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Action": [
        "s3:GetBucketLocation",
        "s3:ListBucket",
        "s3:ListBucketMultipartUploads"
      ],
      "Effect": "Allow",
      "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket"
    },
    {
      "Action": [
        "s3:AbortMultipartUpload",
        "s3:DeleteObject",
        "s3:GetObject",
        "s3:ListMultipartUploadParts",
        "s3:PutObject",
```

```
        "s3:GetObjectTagging",
        "s3:PutObjectTagging"
      ],
      "Effect": "Allow",
      "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket/*"
    }
  ]
}
```

Prerequisite: Required destination account permissions

In your destination account, your *user permissions* must allow you to update your destination bucket's policy and disable its access control lists (ACLs). For more information on these specific permissions, see the *Amazon S3 User Guide*.

Step 1: In your source account, create a DataSync agent

To get started, you must create a DataSync agent that can read from your on-premises storage system and communicate with the DataSync service. This process includes deploying an agent in your on-premises storage environment and activating the agent in your source AWS account.

> **Note**
>
> The steps in this tutorial apply to any type of agent and service endpoint that you use.

To create a DataSync agent

1. Deploy a DataSync agent in your on-premises storage environment.
2. Choose a service endpoint that the agent will use to communicate with AWS.
3. Activate your agent in your source account.

Step 2: In your source account, create a DataSync IAM role for destination bucket access

In your source account, you need an IAM role that gives DataSync the permissions to transfer data to your destination account bucket.

Since you're transferring across accounts, you must create the role manually. (DataSync can create this role for you in the console when transferring in the same account.)

Create the DataSync IAM role

Create an IAM role with DataSync as the trusted entity.

To create the IAM role

1. Log in to the AWS Management Console with your source account.
2. Open the IAM console at https://console.aws.amazon.com/iam/.
3. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
4. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.
5. For **Use case**, choose **DataSync** in the dropdown list and select **DataSync**. Choose **Next**.
6. On the **Add permissions** page, choose **Next**.
7. Give your role a name and choose **Create role**.

For more information, see Creating a role for an AWS service (console) in the *IAM User Guide*.

Add permissions to the DataSync IAM role

The IAM role that you just created needs the permissions that allow DataSync to transfer data to the S3 bucket in your destination account.

To add permissions to your IAM role

1. On the **Roles** page of the IAM console, search for the role that you just created and choose its name.
2. On the role's details page, choose the **Permissions** tab. Choose **Add permissions** then **Create inline policy**.
3. Choose the **JSON** tab and do the following:

    a. Paste the following JSON into the policy editor:

Note

The value for `aws:ResourceAccount` should be the account ID that owns the Amazon S3 bucket specified in the policy.

```
{
 "Version": "2012-10-17",
 "Statement": [
     {
         "Action": [
             "s3:GetBucketLocation",
             "s3:ListBucket",
             "s3:ListBucketMultipartUploads"
         ],
         "Effect": "Allow",
         "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket",
         "Condition": {
             "StringEquals": {
              "aws:ResourceAccount": "123456789012"
             }
         }
     },
     {
         "Action": [
             "s3:AbortMultipartUpload",
             "s3:DeleteObject",
             "s3:GetObject",
             "s3:GetObjectTagging",
             "s3:GetObjectVersion",
             "s3:GetObjectVersionTagging",
             "s3:ListMultipartUploadParts",
             "s3:PutObject",
             "s3:PutObjectTagging"
           ],
         "Effect": "Allow",
         "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket/*",
         "Condition": {
             "StringEquals": {
                 "aws:ResourceAccount": "123456789012"
             }
```

```
            }
        }
    ]
}
```

b. Replace each instance of *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.

4. Choose **Next**. Give your policy a name and choose **Create policy**.

Step 3: In your destination account, update your S3 bucket policy

In your destination account, modify the destination S3 bucket policy to include the DataSync IAM role that you created in your source account.

Before you begin: Make sure that you have the required permissions for your destination account.

To update the destination S3 bucket policy

1. In the AWS Management Console, switch to your destination account.
2. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
3. In the left navigation pane, choose **Buckets**.
4. In the **Buckets** list, choose the S3 bucket that you're transferring data to.
5. On the bucket's detail page, choose the **Permissions** tab.
6. Under **Bucket policy**, choose **Edit** and do the following to modify your S3 bucket policy:

   a. Update what's in the editor to include the following policy statements:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "DataSyncCreateS3LocationAndTaskAccess",
      "Effect": "Allow",
      "Principal": {
      "AWS": "arn:aws:iam::111122223333:role/source-datasync-role"
      },
      "Action": [
        "s3:GetBucketLocation",
        "s3:ListBucket",
```

```
        "s3:ListBucketMultipartUploads",
        "s3:AbortMultipartUpload",
        "s3:DeleteObject",
        "s3:GetObject",
        "s3:ListMultipartUploadParts",
        "s3:PutObject",
        "s3:GetObjectTagging",
        "s3:PutObjectTagging"
      ],
      "Resource": [
        "arn:aws:s3:::amzn-s3-demo-destination-bucket",
        "arn:aws:s3:::amzn-s3-demo-destination-bucket/*"
      ]
    }
  ]
}
```

b. Replace each instance of *source-account* with the AWS account ID for your source account.

c. Replace *source-datasync-role* with the IAM role that you created for DataSync in your source account.

d. Replace each instance of *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.

7. Choose **Save changes**.

Step 4: In your destination account, disable ACLs for your S3 bucket

It's important that all the data that you copy to the S3 bucket belongs to your destination account. To ensure that this account owns the data, disable the bucket's access control lists (ACLs). For more information, see Controlling ownership of objects and disabling ACLs for your bucket in the *Amazon S3 User Guide*.

To disable ACLs for your destination bucket

1. While still logged in to the S3 console with your destination account, choose the S3 bucket that you're transferring data to.
2. On the bucket's detail page, choose the **Permissions** tab.
3. Under **Object Ownership**, choose **Edit**.
4. If it isn't already selected, choose the **ACLs disabled (recommended)** option.

5. Choose **Save changes**.

Step 5: In your source account, create a DataSync source location for your on-premises storage

In your source account, create a DataSync source location for the on-premises storage system that you're transferring data from. This location uses the agent that you activated in your source account.

Step 6: In your source account, create a DataSync destination location for your S3 bucket

While still in your source account, create a location for the S3 bucket that you're transferring data to.

Before you begin: Make sure that you have the required permissions for your source account.

Since you can't create cross-account locations by using the DataSync console interface, these instructions require that you run a `create-location-s3` command to create your destination location. We recommend running the command by using AWS CloudShell, a browser-based, pre-authenticated shell that you launch directly from the console. CloudShell allows you to run AWS CLI commands like `create-location-s3` without downloading or installing command line tools.

> **Note**
>
> To complete the following steps by using a command line tool other than CloudShell, make sure that your AWS CLI profile uses the same IAM role that includes the required user permissions to use DataSync in your source account.

To create a DataSync destination location by using CloudShell

1. While still in your source account, do one of the following to launch CloudShell from the console:

   - Choose the CloudShell icon on the console navigation bar. It's located to the right of the search box.

- Use the search box on the console navigation bar to search for **CloudShell** and then choose the **CloudShell** option.

2. Copy the following command:

```
aws datasync create-location-s3 \
  --s3-bucket-arn arn:aws:s3:::amzn-s3-demo-destination-bucket \
  --s3-config '{
    "BucketAccessRoleArn":"arn:aws:iam::source-user-account:role/source-datasync-role"
  }'
```

3. Replace *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.
4. Replace *source-user-account* with the AWS account ID for your source account.
5. Replace *source-datasync-role* with the DataSync IAM role that you created in your source account.
6. Run the command in CloudShell.

   If the command returns a DataSync location ARN similar to this, you successfully created the location:

```
{
  "LocationArn": "arn:aws:datasync:us-east-2:123456789012:location/loc-abcdef01234567890"
}
```

7. In the left navigation pane, expand **Data transfer**, then choose **Locations**.

From your source account, you can see the S3 location that you just created for your destination account bucket.

Step 7: In your source account, create and start your DataSync task

Before starting a DataSync task to transfer your data, let's recap what you've done so far:

- In your source account, you created your DataSync agent. The agent can read from your on-premises storage system and communicate with the DataSync service.

- In your source account, you created an IAM role that allows DataSync to transfer data to the S3 bucket in your destination account.
- In your destination account, you configured your S3 bucket so that DataSync can transfer data to it.
- In your source account, you created the DataSync source and destination locations for your transfer.

To create and start the DataSync task

1. While still using the DataSync console in your source account, expand **Data transfer** in the left navigation pane, then choose **Tasks** and **Create task**.
2. On the **Configure source location** page, choose **Choose an existing location**. Choose the source location that you're copying data from (your on-premises storage) then **Next**.
3. On the **Configure destination location** page, choose **Choose an existing location**. Choose the destination location that you're copying data to (the S3 bucket in your destination account) then **Next**.
4. On the **Configure settings** page, give the task a name. As needed, configure additional settings, such as specifying an Amazon CloudWatch log group. Choose **Next**.
5. On the **Review** page, review your settings and choose **Create task**.
6. On the task's details page, choose **Start**, and then choose one of the following:
   - To run the task without modification, choose **Start with defaults**.
   - To modify the task before running it, choose **Start with overriding options**.

When your task finishes, check the S3 bucket in your destination account. You should see the data that moved from your source location.

Related resources

For more information about what you did in this tutorial, see the following topics:

- Creating a role for an AWS service (console)
- Modifying a role trust policy (console)
- Adding a bucket policy by using the Amazon S3 console
- Create an S3 location with the AWS CLI

Tutorial: Transferring data between Amazon S3 buckets across AWS accounts

With AWS DataSync, you can transfer data between Amazon S3 buckets that belong to different AWS accounts.

> **Important**
>
> Transferring data across AWS accounts using the methods in this tutorial works only with Amazon S3. Additionally, this tutorial can help you transfer data between S3 buckets that are also in different AWS Regions.

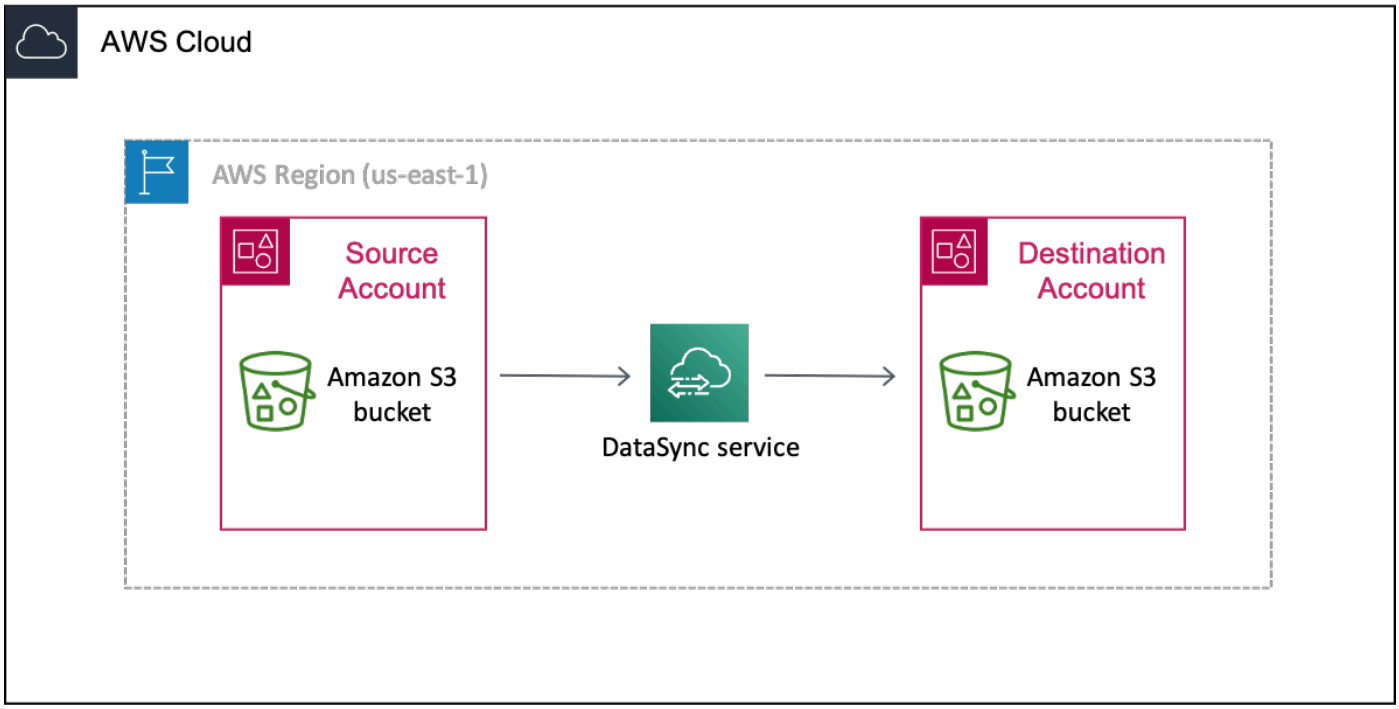
Overview

It's not uncommon to transfer data between AWS accounts, especially if you have separate teams managing your organization's resources. Here's what a cross-account transfer using DataSync can look like:

- **Source account**: The AWS account for managing the S3 bucket that you need to transfer data from.
- **Destination account**: The AWS account for managing the S3 bucket that you need to transfer data to.

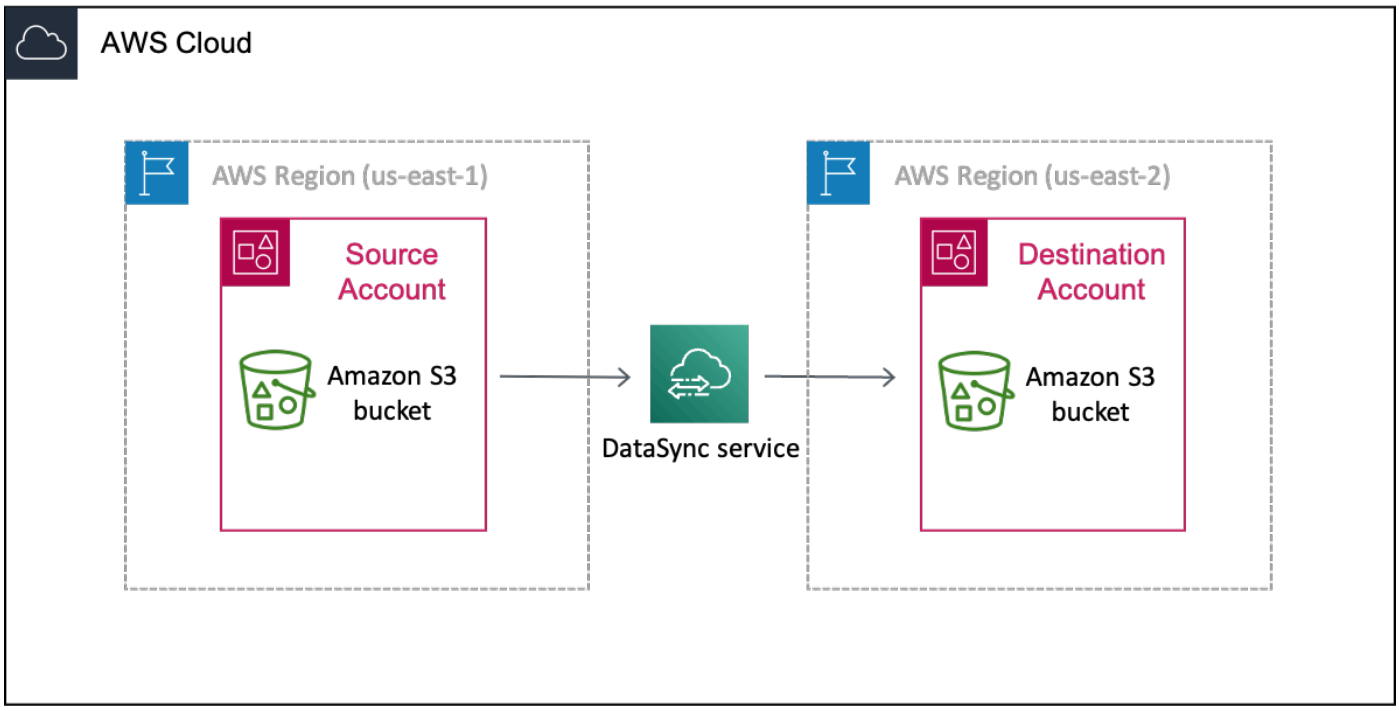
Transfers across accounts

The following diagram illustrates a scenario where you transfer data from an S3 bucket to another S3 bucket that's in a different AWS account.



Transfers across accounts and Regions

The following diagram illustrates a scenario where you transfer data from an S3 bucket to another S3 bucket that's in a different AWS account and Region.



Prerequisite: Required source account permissions

For your source AWS account, there are two sets of permissions to consider with this kind of cross-account transfer:

- *User permissions* that allow a user to work with DataSync (this might be you or your storage administrator). These permissions let you create DataSync locations and tasks.
- *DataSync service permissions* that allow DataSync to transfer data to your destination account bucket.

User permissions for your source account

In your source account, add at least the following permissions to an IAM role for creating your DataSync locations and task. For information on how to add permissions to a role, see creating or modifying an IAM role.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "SourceUserRolePermissions",
            "Effect": "Allow",
            "Action": [
                "datasync:CreateLocationS3",
                "datasync:CreateTask",
                "datasync:DescribeLocation*",
                "datasync:DescribeTaskExecution",
                "datasync:ListLocations",
                "datasync:ListTaskExecutions",
                "datasync:DescribeTask",
                "datasync:CancelTaskExecution",
                "datasync:ListTasks",
                "datasync:StartTaskExecution",
                "s3:GetBucketLocation",
                "s3:ListAllMyBuckets"
            ],
            "Resource": "*"
        },
        {
            "Sid": "IAMPermissions",
            "Effect": "Allow",
```

```
            "Action": [
                "iam:CreateRole",
                "iam:ListRoles",
                "iam:CreatePolicy"
            ],
            "Resource": "arn:aws:iam::111122223333:role/DataSync-*"
        },
        {
            "Sid": "IAMAttachRolePermissions",
            "Effect": "Allow",
            "Action": [
               "iam:AttachRolePolicy"
            ],
            "Resource": "arn:aws:iam::111122223333:role/DataSync-*",
            "Condition": {
               "ArnLike": {
                 "iam:PolicyARN": [
                    "arn:aws:iam::111122223333:policy/DataSync-*",
                    "arn:aws:iam::aws:policy/AmazonS3ReadOnlyAccess",
                    "arn:aws:iam::aws:policy/service-role/AWSDataSyncFullAccess"
                 ]
               }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "iam:PassRole"
            ],
            "Resource": "*",
            "Condition": {
                "StringEquals": {
                    "iam:PassedToService": [
                        "datasync.amazonaws.com"
                    ]
                }
            }
        }
    ]
}
```

> **Tip**
>
> To set up your *user permissions*, consider using AWSDataSyncFullAccess. This is an AWS managed policy that provides a user full access to DataSync and minimal access to its dependencies.

DataSync service permissions for your source account

The DataSync service needs the following permissions in your source account to transfer data to your destination account bucket.

Later in this tutorial, you add these permissions when creating an IAM role for DataSync. You also specify this role (*source-datasync-role*) in your destination bucket policy and when creating your DataSync destination location.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Action": [
        "s3:GetBucketLocation",
        "s3:ListBucket",
        "s3:ListBucketMultipartUploads"
      ],
      "Effect": "Allow",
      "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket"
    },
    {
      "Action": [
        "s3:AbortMultipartUpload",
        "s3:DeleteObject",
        "s3:GetObject",
        "s3:ListMultipartUploadParts",
        "s3:PutObject",
        "s3:GetObjectTagging",
        "s3:PutObjectTagging"
      ],
      "Effect": "Allow",
      "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket/*"
    }
  ]
```

```
}
```

Prerequisite: Required destination account permissions

In your destination account, your *user permissions* must allow you to update your destination bucket's policy and disable its access control lists (ACLs). For more information on these specific permissions, see the *Amazon S3 User Guide*.

Step 1: In your source account, create a DataSync IAM role for destination bucket access

In your source AWS account, you need an IAM role that gives DataSync the permissions to transfer data to your destination account bucket.

Since you're transferring across accounts, you must create the role manually. (DataSync can create this role for you in the console when transferring in the same account.)

Create the DataSync IAM role

Create an IAM role with DataSync as the trusted entity.

1. Log in to the AWS Management Console with your source account.
2. Open the IAM console at https://console.aws.amazon.com/iam/.
3. In the left navigation pane, under **Access management**, choose **Roles**, and then choose **Create role**.
4. On the **Select trusted entity** page, for **Trusted entity type**, choose **AWS service**.
5. For **Use case**, choose **DataSync** in the dropdown list and select **DataSync**. Choose **Next**.
6. On the **Add permissions** page, choose **Next**.
7. Give your role a name and choose **Create role**.

For more information, see Creating a role for an AWS service (console) in the *IAM User Guide*.

Add permissions to the DataSync IAM role

The IAM role that you just created needs the permissions that allow DataSync to transfer data to the S3 bucket in your destination account.

1. On the **Roles** page of the IAM console, search for the role that you just created and choose its name.
2. On the role's details page, choose the **Permissions** tab. Choose **Add permissions** then **Create inline policy**.
3. Choose the **JSON** tab and do the following:

   a. Paste the following JSON into the policy editor:

> **Note**
>
> The value for `aws:ResourceAccount` should be the account ID that owns the Amazon S3 bucket specified in the policy.

```
{
 "Version": "2012-10-17",
 "Statement": [
     {
         "Action": [
             "s3:GetBucketLocation",
             "s3:ListBucket",
             "s3:ListBucketMultipartUploads"
         ],
         "Effect": "Allow",
         "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket",
         "Condition": {
             "StringEquals": {
              "aws:ResourceAccount": "123456789012"
             }
         }
     },
     {
         "Action": [
             "s3:AbortMultipartUpload",
             "s3:DeleteObject",
             "s3:GetObject",
             "s3:GetObjectTagging",
             "s3:GetObjectVersion",
             "s3:GetObjectVersionTagging",
             "s3:ListMultipartUploadParts",
             "s3:PutObject",
```

```
                "s3:PutObjectTagging"
            ],
            "Effect": "Allow",
            "Resource": "arn:aws:s3:::amzn-s3-demo-destination-bucket/*",
            "Condition": {
                "StringEquals": {
                    "aws:ResourceAccount": "123456789012"
                }
            }
        }
    ]
}
```

b. Replace each instance of *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.

4. Choose **Next**. Give your policy a name and choose **Create policy**.

Step 2: In your destination account, update your S3 bucket policy

In your destination account, modify the destination S3 bucket policy to include the DataSync IAM role that you created in your source account.

Before you begin: Make sure that you have the required permissions for your destination account.

Update your destination S3 bucket policy

1. In the AWS Management Console, switch to your destination account.
2. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
3. In the left navigation pane, choose **Buckets**.
4. In the **Buckets** list, choose the S3 bucket that you're transferring data to.
5. On the bucket's detail page, choose the **Permissions** tab.
6. Under **Bucket policy**, choose **Edit** and do the following to modify your S3 bucket policy:

   a. Update what's in the editor to include the following policy statements:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "DataSyncCreateS3LocationAndTaskAccess",
```

```
      "Effect": "Allow",
      "Principal": {
      "AWS": "arn:aws:iam::111122223333:role/source-datasync-role"
      },
      "Action": [
        "s3:GetBucketLocation",
        "s3:ListBucket",
        "s3:ListBucketMultipartUploads",
        "s3:AbortMultipartUpload",
        "s3:DeleteObject",
        "s3:GetObject",
        "s3:ListMultipartUploadParts",
        "s3:PutObject",
        "s3:GetObjectTagging",
        "s3:PutObjectTagging"
      ],
      "Resource": [
        "arn:aws:s3:::amzn-s3-demo-destination-bucket",
        "arn:aws:s3:::amzn-s3-demo-destination-bucket/*"
      ]
    }
  ]
}
```

b. Replace each instance of *source-account* with the AWS account ID for your source account.

c. Replace *source-datasync-role* with the IAM role that you created for DataSync in your source account.

d. Replace each instance of *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.

7. Choose **Save changes**.

Step 3: In your destination account, disable ACLs for your S3 bucket

It's important that all the data that you transfer to the S3 bucket belongs to your destination account. To ensure that this account owns the data, disable the bucket's access control lists (ACLs). For more information, see Controlling ownership of objects and disabling ACLs for your bucket in the *Amazon S3 User Guide*.

Before you begin: Make sure that you have the required permissions for your destination account.

Disable your destination S3 bucket ACLs

1. While still logged in to the S3 console with your destination account, choose the S3 bucket that you're transferring data to.
2. On the bucket's detail page, choose the **Permissions** tab.
3. Under **Object Ownership**, choose **Edit**.
4. If it isn't already selected, choose the **ACLs disabled (recommended)** option.
5. Choose **Save changes**.

Step 4: In your source account, create your DataSync locations

In your source account, create the DataSync locations for your source and destination S3 buckets.

Before you begin: Make sure that you have the required permissions for your source account.

Create your DataSync source location

- In your source account, create a location for the S3 bucket that you're transferring data from.

Create your DataSync destination location

While still in your source account, create a location for the S3 bucket that you're transferring data to.

Since you can't create cross-account locations by using the DataSync console interface, these instructions require that you run a `create-location-s3` command to create your destination location. We recommend running the command by using AWS CloudShell, a browser-based, pre-authenticated shell that you launch directly from the console. CloudShell allows you to run AWS CLI commands like `create-location-s3` without downloading or installing command line tools.

> **Note**
>
> To complete the following steps by using a command line tool other than CloudShell, make sure that your AWS CLI profile uses the same IAM role that includes the required user permissions to use DataSync in your source account.

To create a DataSync destination location by using CloudShell

1. While still in your source account, do one of the following to launch CloudShell from the console:

   - Choose the CloudShell icon on the console navigation bar. It's located to the right of the search box.
   - Use the search box on the console navigation bar to search for **CloudShell** and then choose the **CloudShell** option.

2. Copy the following `create-location-s3` command:

```
aws datasync create-location-s3 \
  --s3-bucket-arn arn:aws:s3:::amzn-s3-demo-destination-bucket \
  --region amzn-s3-demo-destination-bucket-region \
  --s3-config '{
    "BucketAccessRoleArn":"arn:aws:iam::source-account-id:role/source-datasync-role"
  }'
```

3. Replace *amzn-s3-demo-destination-bucket* with the name of the S3 bucket in your destination account.
4. If your destination bucket is in a different Region than your source bucket, replace *amzn-s3-demo-destination-bucket-region* with the Region where the destination bucket resides (for example, *us-east-2*). Remove this option if your buckets are in the same Region.
5. Replace *source-account-id* with the source AWS account ID.
6. Replace *source-datasync-role* with the DataSync IAM role that you created in your source account.
7. Run the command in CloudShell.

   If the command returns a DataSync location ARN similar to this, you successfully created the location:

```
{
  "LocationArn": "arn:aws:datasync:us-east-2:123456789012:location/loc-abcdef01234567890"
}
```

8. In the left navigation pane, expand **Data transfer**, then choose **Locations**.

9. If you created the location in a different Region, choose that Region in the navigation pane.

From your source account, you can see the S3 location that you just created for your destination account bucket.

Step 5: In your source account, create and start your DataSync task

Before starting a DataSync task to transfer your data, let's recap what you've done so far:

- In your source account, you created an IAM role that allows DataSync to transfer data to the S3 bucket in your destination account.
- In your destination account, you configured your S3 bucket so that DataSync can transfer data to it.
- In your source account, you created the DataSync source and destination locations for your transfer.

Create and start your DataSync task

1. While still using the DataSync console in your source account, expand **Data transfer** in the left navigation pane, then choose **Tasks** and **Create task**.
2. If the bucket in your destination account is in a different Region than the bucket in your source account, choose the destination bucket's Region in the top navigation pane.

   > **Important**
   >
   > To avoid a network connection error, you must create your DataSync task in the same Region as the destination location.

3. On the **Configure source location** page, do the following:

   a. Select **Choose an existing location**.

   b. (For transfers across Regions) In the **Region** dropdown, choose the Region where the source bucket resides.

   c. For **Existing locations**, choose the source location for the S3 bucket that you're transferring data from, then choose **Next**.

4. On the **Configure destination location** page, do the following:

a. Select **Choose an existing location**.

b. For **Existing locations**, choose the destination location for the S3 bucket that you're transferring data to, then choose **Next**.

5. On the **Configure settings** page, choose a **Task mode**.

> **Tip**
>
> We recommend using **Enhanced** mode. For more information, see Choosing a task mode for your data transfer.

6. Give the task a name and configure additional settings, such as specifying an Amazon CloudWatch log group. Choose **Next**.
7. On the **Review** page, review your settings and choose **Create task**.
8. On the task's details page, choose **Start**, and then choose one of the following:

- To run the task without modification, choose **Start with defaults**.
- To modify the task before running it, choose **Start with overriding options**.

When your task finishes, check the S3 bucket in your destination account. You should see the data that moved from your source account bucket.

Troubleshooting

Refer to the following information if you run into issues trying to complete your cross-account transfer.

Connection errors

When transferring between S3 buckets in different AWS accounts and Regions with Basic mode tasks, you might get a network connection error when starting your DataSync task. To resolve this, use an Enhanced mode task. Alternatively, create a Basic mode task in the same Region as your destination location and try running that task.

Related: Cross-account transfers with S3 buckets using server-side encryption

If you're trying to do this transfer with S3 buckets using server-side encryption, see the AWS Storage Blog for instructions.

Performing a large data migration with AWS DataSync

Large-scale data migrations can involve transferring significant volumes of data that encompass millions of files or objects in various formats. AWS DataSync simplifies these complex transfers by managing scheduling, monitoring, encryption, and data verification.

What is a large data migration?

A large data migration typically involves transferring terabytes or more of data spread across various sources to a new destination storage environment (in this case, AWS). These migrations require careful planning and coordination within your organization to move data successfully while minimizing business disruption.

DataSync can simplify these migrations, which are usually complex in nature. Some benefits of using DataSync for your migration include:

- Automated management of data-transfer processes and the infrastructure required for high performance and secure data transfers.
- End-to-end security, including encryption and data integrity validation, to help ensure that your data arrives securely, intact, and ready to use.
- A purpose-built network protocol and a parallel, multi-threaded architecture to speed up migrations.

Key stages of a large data migration

You can usually break down a large migration into the following stages:

- **(Stage 1) Planning your data migration** - At this stage, you're trying to understand why you're migrating and what sort of data you're working with. Planning activities include:
  - Understanding why you want to migrate
  - Assembling a team to help you with all aspects of the migration.
  - Identifying data locations, formats, and usage patterns
  - Assessing available hardware resources and network requirements (if you're migrating from an on-premises data center)

  - Running proof of concept (POC) tests with DataSync to estimate migration timelines, plan cutover windows, and get a sense of how you need to configure DataSync
- **(Stage 2) Implementing your large data migration** - At this point, you're validating your plan and starting the migration. Implementation activities include:
  - Validating the migration plan
  - Executing phased cutovers that include monitoring and verifying your data transfers as expected
  - Optimizing and adjusting as needed in between each cutover
  - Cleaning up unused resources once you're done

Additional resources

AWS Prescriptive Guidance has the following resources that can help you plan and implement a large migration. Use this guide to understand how DataSync can work in the context of common migration processes and activities.

- Large migrations to the AWS cloud
- Strategy and best practices for AWS large migrations
- Migrate shared file systems in an AWS large migration – This resource includes an **SFS-Discovery-Workbook** that you can download and use to plan a migration at the file share level.

Stage 1: Planning your large data migration

Planning is essential when migrating a large dataset. You must understand the data you're migrating, your motivations for the migration, and how AWS DataSync can help you get your data where you want it.

Topics

- Gathering requirements for your migration
- Running a DataSync proof of concept
- Estimating migration timelines

Gathering requirements for your migration

The first step in a large data migration requires collecting a variety of information across your organization.

This information helps you create a migration process, which for large migrations can include multiple transfers and procedures for cutting over operations (done in waves) from your source to your destination storage.

Understanding why you want to migrate

Before you can start migrating to AWS, you need to clearly understand why you're migrating your data. This helps address common migration challenges such as meeting deadlines, managing resources, and coordinating across teams.

If you need help determining your motivations for the migration, answer these questions:

- Are you freeing up on-premises storage space?
- Are you meeting hardware support contract deadlines?
- Is this for a data center exit?
- What's your migration timeline?
- Are you transferring data from other cloud storage?
- Are you migrating partial or complete datasets?
- Is this for data archival?
- Do applications or users need regular access to this data?

Figuring out logistics

Address some basic logistics about your storage environment, the migration, and your organization:

1. Get a basic understanding of your current data storage infrastructure.
2. Verify whether you need a DataSync agent. For example, you need an agent if you're transferring from on-premises storage.
3. If you need an agent, make sure that you understand the agent requirements:

- An agent can run as a virtual machine (VM) on VMware ESXi, Linux Kernel-based Virtual Machine (KVM), and Microsoft Hyper-V hypervisors. You also can deploy an agent as an Amazon EC2 instance within AWS.
- Large migrations are typically memory intensive. Make sure that your agent has enough RAM.

4. Identify key stakeholders from your leadership, networking, storage, and IT departments who need to be involved in the migration. This can include:
   - Find a single-threaded leader who's dedicated to the project and its results.
   - Determine who's responsible for the ownership and classification of the data that you're migrating.
   - Identify who manages your source and who eventually will manage the AWS storage service that you're migrating to.
   - Find out who will create and manage any other processes for your data once it's in AWS.
5. Establish cross-department communication channels.
6. Create a rollback plan for contingencies.
7. Document the complete migration process, including waves, validation, and cutover procedures. Use this as your runbook for the entire migration. You will update this process as you plan and implement the migration.

Reviewing the data you're migrating

Work with your storage and application teams to analyze the characteristics of the data you're migrating. This information helps you determine a migration strategy that you can execute with DataSync.

Contents

Determining data usage patterns

- For actively used data with frequent modifications, plan for multiple waves of incremental transfers to avoid disrupting business operations.
- For read-only data that might be considered archival, you might not need to plan for waves.
- If you have a mix of data usage patterns, plan waves that migrate these different datasets separately. For example, you might have one wave for archive data, with the rest of the waves dedicated to migrating active data.

Identifying data structure and layout

- Determine if data is organized by time periods (year, month, day) or other patterns.
- Use this organization structure to plan your migration waves. For example, you might migrate a year's worth of archive data during one wave.

Documenting shares and folders

- Create an inventory of shares and folders (including file or object counts for each).
- Identify shares and folders with active datasets. These might require incremental transfers during the migration.
- Review the DataSync quotas. This can help you plan how to partition your dataset when configuring DataSync.

Analyzing file sizes

- Expect higher data throughput for transfers with larger files (MB or GB) compared to smaller files (KB).
- If you're working with a lot of smaller files, expect more metadata operations on your storage system and lower data throughput. DataSync performs these operations when comparing and verifying your source and destination locations.

Identifying storage requirements

To choose a compatible AWS storage service to migrate your data, you need to evaluate your source storage system's characteristics and performance.

This information can also help you schedule your transfers to minimize impact on business operations during the migration.

Contents

Determining source storage support

DataSync can work with a variety of storage systems that allow access through NFS, SMB, HDFS, and S3 compatible object storage clients.

If you're migrating from other cloud storage, verify that DataSync can work with that provider. For a list of supported source locations, see Where can I transfer my data with AWS DataSync?

Reviewing metadata preservation requirements

DataSync can preserve your file or object metadata during a transfer. How your metadata gets preserved depends on your transfer locations and if those locations use similar types of metadata.

DataSync in some cases needs additional permissions to preserve file metadata, such as NTFS discretionary access lists (DACLs).

For more information, see Understanding how DataSync handles file and object metadata.

Collecting performance metrics from source storage

Measure baseline IOPS and disk throughput during average and peak workloads for your source storage. Transferring data adds I/O overhead to both your source and destination storage systems.

Compare this performance data against your storage system's specifications to determine available performance resources.

Choosing a destination AWS storage service

At this point, you might have an idea what AWS storage service makes sense for your data. If not, data usage patterns and storage performance are a couple areas to think about when deciding. For

example, you might consider Amazon S3 if you have archive data and Amazon FSx or Amazon EFS for active data.

To help you decide the right object or file-based storage for your data, see Choosing an AWS storage service.

Determining network requirements

To migrate your data with DataSync, you must establish network connections between your source storage, agent, and AWS. You also need to plan for enough network bandwidth and infrastructure.

Work with your network engineers and storage administrators to gather the following network requirements.

Contents

Assessing your available network bandwidth

Your available network bandwidth factors into your transfer speeds and overall migration time. If you're transferring from an on-premises storage system, do the following:

- Work with your network team to determine average and peak bandwidth utilization.
- Identify windows when you can transfer data and avoid disrupting daily operations. This will inform when your migration waves and cutovers happen.

You can control how much bandwidth DataSync uses. For more information, see Setting bandwidth limits for your AWS DataSync task.

Since transfers from other cloud storage typically happen over the public internet, there usually are less bandwidth restrictions and considerations with these transfers.

Considering options for connecting your network to AWS

Consider the following options for establishing network connectivity for your DataSync transfer:

- **Direct Connect** - Review the architecture and routing examples for using Direct Connect with DataSync. You can monitor Direct Connect activity using Amazon CloudWatch.
- **VPN** - AWS Site-to-Site VPN offers up to 1.25 Gbps throughput per tunnel.
- **Public internet** - Contact with your internet service provider for network usage data.

Choosing a service endpoint for agent communication

DataSync agents use service endpoints to communicate with the DataSync service. The type of endpoint you use depends on the how you're connecting for your network to AWS.

Planning for enough network infrastructure

For every transfer task that you create, DataSync automatically generates and manages the network infrastructure for your data transfers. This infrastructure is known as *network interfaces* or *elastic network interfaces*, which are logical networking components in an Amazon virtual private cloud (VPC) that represent virtual network cards. For more information, see the *Amazon EC2 User Guide*.

Each network interface uses a single IP address in your destination VPC subnet. To make sure that you have enough network infrastructure for your migration, do the following:

- Note the number of network interfaces that DataSync will create for your DataSync destination location.
- Make sure that your subnet has enough IP addresses for your DataSync tasks. For example, a task that uses an agent requires four IP addresses. If you create four tasks for your migration, that means you need 16 available IP addresses in your subnet.

Running a DataSync proof of concept

Running a proof of concept (POC) with AWS DataSync helps you validate the following aspects of your data migration planning:

- Verify network connectivity between source and destination locations.
- Validate your initial DataSync task configuration.
- Measure data transfer performance.
- Estimate migration timelines.

- Define success criteria with the key stakeholders working on the migration.

Getting started with your proof of concept

1. Create your DataSync agent:
    1. Deploy your agent.
    2. Choose a service endpoint for your agent.
    3. Activate your agent.
    4. Verify your agent's network connections.
2. Select a small subset of data that represents the data that you're migrating.

    For example, if your source storage has a mix of large and small files, the subset of data you transfer in your POC should reflect that. This gives you a preliminary understanding of performance from the storage systems, your network, and DataSync.
3. Create a DataSync source location for your on-premises or other cloud storage system.
4. Create a DataSync destination location for your AWS storage service.
5. Create a DataSync transfer task with a filter that only transfers your data subset.
6. Start your DataSync task.
7. Collect transfer performance metrics by monitoring the following:
    - Your task execution's data and file throughput. You can do this through the DataSync console or the DescribeTaskExecution operation. If you use `DescribeTaskExecution`, here's how you calculate these metrics:
        - **Data throughput**: Divide `BytesWritten` by `TransferDuration`
        - **File throughput**: Divide `FilesTransferred` by `TransferDuration`
    - Source and destination storage utilization. Work closely with your storage administrators to get this information.
    - Network usage.
8. Verify the transferred data at your destination location:
    - Review your CloudWatch logs for task execution errors.
    - Verify that permissions and metadata are preserved at the destination location.
    - Confirm that applications and users can access destination data as expected.

- Address any issues that you encounter. For more information, see Troubleshooting AWS DataSync issues.

9. Run your task a few more times to get an idea how long it takes DataSync to prepare, transfer, and verify your data. (For more information, see Task execution statuses.)

   If you run a task more than once, DataSync by default performs an incremental transfer and copies only the data that's changed from the previous task run.

   While the transfer time will likely be shorter for incremental transfers, DataSync will always prepare your transfer the same way by scanning and comparing your locations to identify what to transfer. You can use these preparation times to estimate cutover timelines for your migration.

10. If needed, update your migration plan based on what you learned during the POC.

Estimating migration timelines

Using the information you've collected to this point, you can estimate how long the migration will take using AWS DataSync.

Estimating data transfer timelines

You can estimate how long it takes DataSync to transfer your data based on the following information you collected during migration requirements gathering and your DataSync proof of concept (POC):

- Your available network bandwidth
- Source and destination storage utilization metrics
- Performance metrics from your DataSync POC

To estimate a data transfer timeline

1. Compare the data and file throughput from your POC with your available network bandwidth.
2. If your throughput is lower than your available bandwidth (such as 300 MiB/s for throughput with 10 Gbps of network bandwidth), consider partitioning your dataset into multiple tasks to maximize bandwidth usage.

DataSync has a few options for partitioning your dataset. For more information, see Accelerating your migration with data partitioning.

3. Calculate how many days a transfer takes by using the following formula, which provides a theoretical minimum transfer time:

```
(DATA_SIZE * 8 bits per byte)/(CIRCUIT * NETWORK_UTILIZATION percentage * 3600
 seconds per hour * AVAILABLE_HOURS) = Number of days
```

When using this formula, replace the following with your own values:

- `DATA_SIZE`: The amount of data that you're migrating (expressed in bytes).
- `CIRCUIT`: Your available network bandwidth (expressed in bits per second).
- `NETWORK_UTILIZATION`: What percent of your network is being used.
- `AVAILABLE_HOURS`: The number of operational hours available in each day.

For example, you would calculate a migration with 100 TB of data, a 1 Gbps internet connection, 80 percent network utilization, and 24 hours per day availability like this:

```
(100,000,000,000,000 bytes * 8) / (1,000,000,000 bps * 0.80 * 3600 *
24) = 11.57 days
```

In this case, the migration would take almost 12 days before accounting for real-world conditions.

4. Adjust your calculated transfer duration to account for real-world conditions:

- Network performance fluctuations
- Storage performance variations
- Downtime between migration waves

Estimating cutover timelines

If you're migrating active datasets, you likely need cutovers so that you don't disrupt business operations.

Don't underestimate how long cutovers take. With large migrations, it's not uncommon for cutover activities to take up to 30 percent of your overall migration time.

1. Evaluate if you need to perform cutovers in waves to reduce the amount of data scanned for incremental changes.

   One strategy for doing this is cutting over datasets that you partition based on shares, folders, or storage systems.
2. Review how long it generally took DataSync to prepare, transfer, and verify your data during the POC.

   Note in particular the prepare durations of your task executions. To find this information, run the DescribeTaskExecution operation, then check the value of PrepareDuration for the duration time (in milliseconds).
3. Estimate how long a cutover might take by measuring the time delta across parallel tasks.

   For more information on parallel tasks, see Accelerating your migration with data partitioning.
4. Use your cutover estimation to schedule your cutovers. These essentially are maintenance windows when your source data can't be modified.

Next steps

After estimating your timelines, you're ready to start implementing your migration.

Stage 2: Implementing your large data migration

With the information you gathered during planning, you can begin using AWS DataSync to migrate to your new storage system. If you haven't already, we recommend reviewing the AWS Prescriptive Guidance resources for large migrations.

Topics

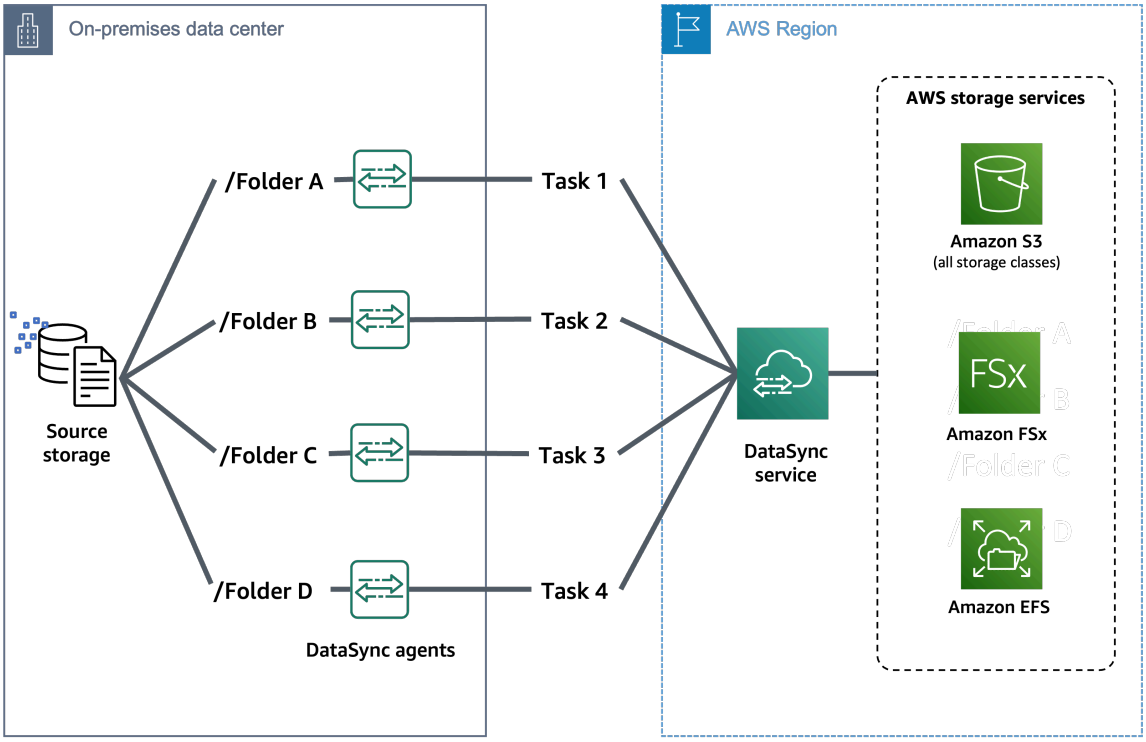
- Accelerating your migration with data partitioning
- Running your DataSync transfer tasks
- Monitoring your transfers

Accelerating your migration with data partitioning

With a large migration, we recommend partitioning your dataset with multiple DataSync tasks. Partitioning your source data across multiple tasks (and possibly agents) lets you parallelize your transfers and reduce the migration timeline.

Partitioning also helps you stay within DataSync quotas and simplifies the monitoring and debugging of your tasks.

The following diagram shows how you might use multiple DataSync tasks and agents to transfer data from the same source storage location. In this scenario, each task focuses on a specific folder in the source location. For more information and examples on these approaches, see How to accelerate your data transfers with AWS DataSync scale out architectures.



Partitioning your dataset by folder or prefix

When creating your DataSync source location, you can specify a folder, directory, or prefix that DataSync reads from. For example, if you're migrating a file share with top-level directories, you can create multiple locations that specify a different directory path. You can then use these locations to run multiple DataSync tasks during your migration.

Partitioning your dataset with filters

You can apply filters to include or exclude data from your source location in a transfer. In the context of a large migration, filters can help you scope tasks to specific portions of your dataset.

For example, if you're migrating archive data that's organized by year, you can create an include filter to match for a specific year or multiple years. You also can modify the filter each time you run the task to match a different year.

Partitioning your dataset with manifests

A manifest is a list of files or objects that you want DataSync to transfer. With a manifest, DataSync doesn't have to read everything in a source location to determine what to transfer.

You can create manifests from inventories of your source storage or through event-driven approaches (for example, see Implementing AWS DataSync with hundreds of millions of objects). You can also use a different manifest each time you start a task, allowing you to transfer different sets of data with the same task.

Running your DataSync transfer tasks

During each of your migration waves, your data transfer usually follows the same general process:

1. Run an initial full transfer of your data.
2. Verify the data in the destination.
3. Run incremental transfers for any data that might have changed since the initial transfer.
4. Cut over operations to your destination location.
5. Review cutover results.

Running your tasks

You likely will need to run your DataSync transfer tasks during business hours to minimize your overall migration time. It's common in these situations to run an initial full transfer followed by incremental transfers that account for changes to your source location from users and applications.

To avoid network-related issues during business hours, you can limit the amount of bandwidth that your tasks use. For more information, see Setting bandwidth limits for your AWS DataSync task.

1. Run an initial full transfer:
    a. Start your DataSync task (or tasks if you're running tasks in parallel).
    b. Monitor the progress and performance of your task executions.
    c. Verify that your data transferred the way you expect (for example, file metadata is preserved).
2. Run incremental transfers:
    a. Schedule your tasks to run periodically.

b. Monitor your task executions and fix errors if encountered.

Performing a cutover

After your initial and incremental transfers, you can start the process of cutting over operations to your destination location.

1. Start the scheduled maintenance window.
2. Update your source storage system to be read only for applications and users.
3. Run final incremental transfers to copy remaining deltas between your source and destination locations.
4. Conduct a thorough data validation (for example, by reviewing CloudWatch logs and task reports).
5. Switch your applications and users to the new environment of your destination location.
6. Test application functionality and make sure that users can access data in your destination location.
7. Schedule a retrospective meeting to review the transfer with the migration teams. Ask the following probing sample questions:
   - Was the cutover successful? If not, what was the issue?
   - Did we use all available bandwidth?
   - Was the source and destination storage fully utilized?
   - Can we get more data throughput with additional tasks?
   - Do we need to plan for a longer maintenance window?
8. If needed, update your migration plan before starting the next wave.

Monitoring your transfers

AWS DataSync provides several monitoring options to help you validate and debug your transfer.

Monitoring your transfers with CloudWatch metrics

You can create custom CloudWatch dashboards with metrics from your DataSync task executions. For more information, see Monitoring data transfers with Amazon CloudWatch metrics.

Monitoring your transfers with task reports

If you're transferring millions of files or objects, considering using task reports. Task reports provide detailed information about what DataSync attempts to transfer, skip, verify, and delete during a task execution. For more information, see Monitoring your data transfers with task reports.

You can also visualize your task reports by using AWS services such as AWS Glue, Amazon Athena, and Amazon Quick. For more information, see the AWS Storage Blog.

Monitoring your transfers with CloudWatch Logs

At minimum, we recommend that you configure your task to log basic information and transfer errors. For more information, see Monitoring data transfers with Amazon CloudWatch Logs.

Document history

The following table describes important additions to the AWS DataSync documentation. We also update the documentation frequently to address feedback that you send us.

To get notified about updates to this documentation, subscribe to the RSS feed.

Change	Description	Date
Support added for VPC endpoint policies and FIPS enabled VPC endpoints	You can now use VPC endpoint policies and choose FIPS VPC endpoints in FIPS-enabled AWS Regions.	September 30, 2025
Support added for IPv6 addresses	You can now use IPv4 and IPv6 addresses to connect with DataSync and for data transfers with supported data sources.	July 16, 2025
Discovery no longer available	As of May 20, 2025, Discovery is no longer an available DataSync feature.	May 20, 2025
AWS managed policy update - Update to existing policy	The `AWSDataSyncFullAccess` policy has updated permission statements that remove tagging conditions from the permissions DataSync uses to create Secrets Manager secrets.	May 13, 2025
AWS managed policy update - Update to existing policy	The `AWSDataSyncFullAccess` policy has new permissions that allow DataSync to work with AWS Secrets Manager.	May 7, 2025

AWS managed policy update - Update to existing policy	The `AWSDataSyncFullAccess` policy has new permissions that allow DataSync to work with AWS Secrets Manager.	April 23, 2025
AWS managed policy update - Update to existing policy	The `AWSDataSyncFullAccess` policy has new permissions that allow DataSync to work with AWS Secrets Manager and AWS Key Management Service.	April 23, 2025
AWS managed policy update - Update to existing policy	The `AWSDataSyncServiceRolePolicy` has new permissions that allow DataSync to work with AWS Secrets Manager.	April 15, 2025
Performing large data migrations	Learn how to plan large-scale data migrations using DataSync for transferring files or objects from on-premises or other cloud storage to AWS.	February 19, 2025
Support for Kerberos with SMB locations	DataSync can now use Kerberos authentication when connecting to Server Message Block (SMB) file servers.	January 28, 2025
New AWS Region	AWS DataSync is available for data transfers in the Mexico (Central) Region.	January 14, 2025
New AWS Region	AWS DataSync is available for data transfers in the Asia Pacific (Thailand) Region.	January 7, 2025

Update AWS storage locations	You can now update your Amazon S3, Amazon EFS, and Amazon FSx transfer locations .	December 18, 2024
No longer supporting Snowball Edge	As of November 12, 2024, DataSync no longer supports AWS Snowball Edge.	November 13, 2024
New AWS managed policy	The DataSync service-linked role named `AWSServiceRoleForDataSync` uses a new managed policy named `AWSDataSyncServiceRolePolicy` .	October 30, 2024
Introducing Enhanced mode	With Enhanced mode, you can transfer virtually unlimited numbers of objects between Amazon S3 locations.	October 30, 2024
AWS managed policy updates - Update to an existing policy	The `AWSDataSyncFullAccess` policy has a new permission for services that work with DataSync.	October 30, 2024
Support for Azure storage general-purpose v1 accounts	DataSync can work with Azure storage general-purpose v1 accounts when transferring to or from Microsoft Azure Blob Storage.	October 4, 2024
New way to configure task schedules	You can configure your DataSync task schedules by using rate expressions.	August 22, 2024

New AWS Region	AWS DataSync is available for data transfers in the Asia Pacific (Malaysia) Region.	August 21, 2024
Support for agentless cross-Region transfers that include an opt-in Region	You no longer need a DataSync agent for transfers between AWS storage services when at least one storage location is in an opt-in AWS Region.	July 24, 2024
AWS managed policy updates - Update to an existing policy	The `AWSDataSyncFullAccess` policy has a new permission for services that work with DataSync.	July 22, 2024
Updated S3 cross-account tutorial	Removed some source account user permissions that are no longer required for this transfer.	June 10, 2024
New task execution status	The `CANCELLING` status indicates when a task execution is being cancelled.	May 15, 2024
New option for pausing task schedules	You can disable your AWS DataSync task schedule when you need to troubleshoot issues or perform storage system maintenance.	April 24, 2024
Updated TLS cipher for FIPS endpoints	AWS DataSync uses the TLS_AES_128_GCM_SHA256 (secp256r1) cipher for Federal Information Processing Standard (FIPS) service endpoints.	April 22, 2024

AWS managed policy updates - Update to an existing policy	The `AWSDataSyncFullAccess` policy has a new permission for services that work with DataSync.	February 16, 2024
Transfer specific files or objects with a manifest	AWS DataSync can transfer a list of files or objects by using a manifest.	February 7, 2024
New AWS Region	AWS DataSync is now available for data transfers in the Canada West (Calgary) Region.	December 20, 2023
Support for transfers with additional cloud providers	AWS DataSync can now transfer data between AWS storage services and IBM Cloud Object Storage or Seagate Lyve Cloud.	November 7, 2023
Support for transfers with Alibaba Cloud Object Storage Service	AWS DataSync can now transfer data between AWS storage services and Alibaba Cloud Object Storage Service.	September 25, 2023
Support for task reports	Monitor your AWS DataSync transfers with task reports.	August 30, 2023
New AWS Region	AWS DataSync is now available for data transfers in the Israel (Tel Aviv) Region.	August 23, 2023

Support for transfers with additional cloud providers	AWS DataSync can now transfer data between AWS storage services and several other cloud providers (such as Wasabi Cloud Storage, DigitalOcean Spaces, and Oracle Cloud Infrastructure Object Storage).	August 8, 2023
General availability of Microsoft Azure Blob Storage support	AWS DataSync can now transfer objects to and from Microsoft Azure Blob Storage.	July 25, 2023
TLS 1.3 support	When transferring between storage locations, AWS DataSync now encrypts all network traffic with Transport Layer Security (TLS) 1.3.	June 28, 2023
New DataSync Discovery metrics	AWS DataSync Discovery can now tell you how many LUNs (logical unit numbers) are in a storage resource cluster, storage virtual machine (SVM), or volume.	June 28, 2023
New AWS Region	AWS DataSync is now available for data transfers in the Asia Pacific (Melbourne) Region.	May 24, 2023
Support for with S3 compatible storage on Snowball Edge	You can use AWS DataSync to transfer data between Amazon S3 compatible storage on AWS Snowball Edge and AWS storage services.	May 18, 2023

AWS managed policy updates - Update to an existing policy	The `AWSDataSyncFullAccess` policy has new permissions for services that work with DataSync.	May 2, 2023
General availability of AWS DataSync Discovery	Use DataSync Discovery to help accelerate your migration to AWS.	April 25, 2023
Public preview release of Microsoft Azure Blob Storage support	AWS DataSync can now transfer objects from Microsoft Azure Blob Storage.	March 29, 2023
New IAM policy	To support the DataSync Discovery feature, DataSync uses the service-linked role named `AWSServiceRoleForDataSyncDiscovery` .	March 21, 2023
New AWS Regions	AWS DataSync is now available in the following AWS Regions: Asia Pacific (Hyderabad), Europe (Spain), and Europe (Zurich).	February 6, 2023
Using tags in task executions	You can now tag your AWS DataSync task executions.	December 16, 2022
Support for S3 Glacier Instant Retrieval	You can now transfer objects directly into the S3 Glacier Instant Retrieval storage class.	December 16, 2022
Copying object system metadata	AWS DataSync can now copy system metadata when transferring between an object storage system and Amazon S3.	December 16, 2022

New AWS Regions	AWS DataSync is now available in the China (Beijing) and China (Ningxia) Regions.	December 14, 2022
New AWS Region	AWS DataSync is now available in the Middle East (UAE) Region.	November 16, 2022
Support for self-signed certificates with object storage locations	AWS DataSync can connect to object storage locations that use self-signed or private certificates.	October 25, 2022
Get data compression information	AWS DataSync can provide the physical number of bytes transferred over the network after compression was applied.	October 25, 2022
Public preview release of AWS DataSync Discovery	Use DataSync Discovery to help accelerate your migration to AWS.	September 21, 2022
New option for migrating data to or from Google Cloud Storage	You can transfer data to or from Google Cloud Storage by deploying an AWS DataSync agent in Google Cloud.	July 21, 2022
Support for Amazon FSx for NetApp ONTAP file systems	AWS DataSync can now transfer files and folders to and from FSx for ONTAP file systems.	June 28, 2022
New security options for Amazon EFS locations	AWS DataSync can access Amazon EFS file systems using TLS, access points, and IAM roles.	May 31, 2022

Migrating data to or from Google Cloud Storage and Azure Files	With AWS DataSync, you can transfer data to or from Google Cloud Storage and Azure Files. For more information, see Creating a location for object storage and Creating a location for SMB.	May 24, 2022
New AWS DataSync task setting	With the **Copy object tags** option, you can specify whether to maintain object tags when transferring between object storage systems.	May 5, 2022
New AWS Region	AWS DataSync is now available in the Asia Pacific (Jakarta) Region.	April 19, 2022
Support for Amazon FSx for OpenZFS file systems	AWS DataSync can now transfer files and folders to and from FSx for OpenZFS file systems.	April 5, 2022
Support for Amazon FSx for Lustre file systems	AWS DataSync can now transfer files and folders to and from FSx for Lustre file systems.	December 10, 2021
Support for Hadoop Distributed File Systems (HDFS)	AWS DataSync now supports transferring files and folders to and from HDFS clusters.	November 3, 2021
New AWS Region	AWS DataSync is now available in the Asia Pacific (Osaka) Region.	July 28, 2021

Fully automated transfers between AWS storage services	AWS DataSync can now transfer files or objects between Amazon S3, Amazon EFS, or FSx for Windows File Server with just a few clicks in the DataSync console.	November 9, 2020
Adjusting the network bandwidth used by a running task	AWS DataSync now enables customers to adjust the network bandwidth used by a running DataSync task. This helps to minimize impact on other users or applications when a task spans multiple days.	November 9, 2020
Enhanced support for on-premises DataSync virtual machine (VM) functions	The AWS DataSync agent VM host console now supports enhanced functions, including activating an agent from the local console.	October 19, 2020
AWS DataSync can now transfer data to and from AWS Outposts	DataSync now supports transferring objects to and from Amazon S3 on AWS Outposts.	September 30, 2020
Support for API filtering	AWS DataSync now supports filtering for the `ListTasks` and `ListLocations` API calls, enabling you to easily retrieve configuration of data transfer tasks by using filters such as the source or destination for the data transfer.	August 18, 2020

Support for copying data from your self-managed object storage	AWS DataSync now supports data transfer between self-managed object storage and Amazon S3, Amazon Elastic File System, or FSx for Windows File Server.	July 27, 2020
Support for Linux Kernel-based Virtual Machine (KVM) and Microsoft Hyper-V hypervisors	AWS DataSync now provides the ability to deploy on-premises agents on the KVM and Microsoft Hyper-V virtualization platforms , in addition to the existing VMware and Amazon EC2 options.	July 1, 2020
AWS DataSync can now automatically configure your Amazon CloudWatch Logs configuration	When using DataSync, you now have the option of automatically generating the CloudWatch log group and resource policy required to publish logs for your data transfer, simplifying task creation and monitoring setup.	July 1, 2020

AWS DataSync can now transfer data to and from AWS Snowball Edge	DataSync now supports transferring files to and from AWS Snowball Edge, the smallest member of the AWS Snow Family of edge computing and data transfer devices. Snowball Edge is portable, ruggedized, and secure—small and light enough to fit in a backpack and able to withstand harsh environments.	June 17, 2020
New AWS Region	AWS DataSync is now available in the Africa (Cape Town) Region and the Europe (Milan) Region.	June 16, 2020
Enhanced monitoring capabilities with file-level logging	You can now enable detailed logging for files and objects copied between your NFS servers, SMB servers, Amazon S3 buckets, Amazon EFS file systems, and FSx for Windows File Server file systems.	April 24, 2020
Support for copying data between your SMB share and Amazon FSx for Windows File Server	You can now copy data between your SMB share and FSx for Windows File Server.	January 24, 2020
Support for scheduling tasks	You can now run tasks manually or schedule them to run based on a specified schedule.	November 20, 2019

New AWS Region	AWS DataSync is now available in the Asia Pacific (Hong Kong) Region, Asia Pacific (Mumbai) Region, Europe (Stockholm) Region, South America (São Paulo) Region, and AWS GovCloud (US-East) Region.	November 20, 2019
New AWS Region	AWS DataSync is now available in the Canada (Central) Region, Europe (London) Region, and Europe (Paris) Region.	October 2, 2019
Support for Amazon S3 storage classes	You can now transfer objects directly into Amazon S3 storage classes.	September 24, 2019
New AWS Region	AWS DataSync is now available in the Middle East (Bahrain) Region.	August 28, 2019
Support for copying data between your Server Message Block (SMB) share and Amazon S3 or Amazon EFS	You can now copy data between your SMB file share and Amazon S3 or Amazon EFS.	August 22, 2019
Support for using virtual private cloud (VPC) endpoints	You can now create a private connection between your agent and AWS and run tasks in a private network. Doing this increases the security of your data as it's copied over the network.	August 5, 2019

Support for Federal Information Processing Standard (FIPS) endpoints	You can now use FIPS endpoints to create agents and run tasks.	August 5, 2019
New AWS Region	AWS DataSync is now available in the AWS GovCloud (US-West) Region.	June 11, 2019
Support for filtering	You can now apply filters to transfer only a subset of the files in your source location when you transfer data from your source to your destination location.	May 22, 2019
First release of AWS DataSync	General release of the AWS DataSync service.	November 26, 2018

AWS Glossary

For the latest AWS terminology, see the AWS glossary in the *AWS Glossary Reference*.